JUNE - 1954

ELECTRICAL CONSTRUCTION AND MAINTENANCE

WITH ELECTRICAL CONTRACTING



How electrical work is installed in new lift-slab construction page 75



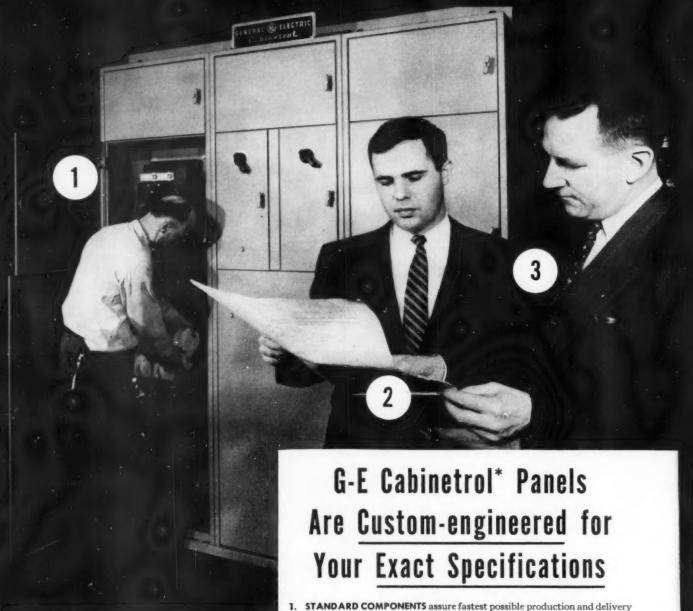
Wiring layout for a

New Orleans waterfront

grain elevator page 65



Light control and sound absorption in an electrical contractor's office page 70



of your panels. Modern factory techniques speed completion of your order.

YOUR REQUIREMENTS are followed exactly. Thorough examination and testing assure "job-tailored" performance.

EXPERIENCED G-E ENGINEERS—working closely with you—design the

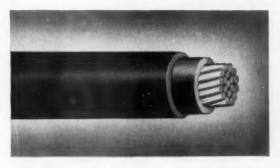
unit to meet your application.

Cabinetrol panels are not costly, improvised modifications of some other type of control center. These panels form a standard low-voltage control system which handles all motor types up to 600 hp from a central location. You get the time-saving and money-saving advantages of standard components which are custom-assembled.

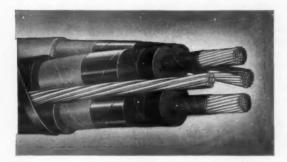
For complete information, contact your nearest G-E Apparatus Sales representative. Or write for the descriptive bulletin, GEA-3856. Section 780-4, General Electric Company, Schenectady 5, New York.

GENERAL ELECTRIC





U. S. Grizzly Power Cable, 600 volts - Type RR single conductor, Hydrosec®-S heat- and moisture-resistant insulation, Neoprene jacket.



U. S. Grizzly Power Cable, 5,000 volts—Type RR
—3-conductor, Uskorona®—ozone-resistant insulation—shielded—Neoprene jacket.

- 1. Lighter in weight than lead-sheathed cables and lead-sheathed armored cables.
- 2. Greater flexibility
- 3. Easier to handle during installation
- 4. Easier to splice, tap and terminate
- 5. More resistant to chemical corrosion
- 6. Unaffected by stray currents
- 7. Better protection against weathering
- 8. Longer life
- 9. Cost less
- 10. Made by United States Rubber Company, the only electrical wire and cable producer to grow its own natural rubber, make its own synthetic rubber and manufacture its own plastics

U. S. Grizzly Power Cables are used for general power distribution, and can be installed in conduits, underground ducts, buried directly in the ground, or installed aerially. Neoprene jacket protects against acids, alkalies, oils, and mechanical damage and weathering. (All IPCEA and NEMA specifications complied with.)

Write to address below for free catalog, U.S. Electrical Wires and Cables.





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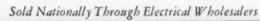
No company thrives for long unless its products satisfy. We're proud that our steady growth for over 50 years continues unabated...and we believe that APPLETON quality and service deserves a large part of the credit. More than 98,000 square feet of floor space were recently added to APPLETON's productive capacity...a good sign of future benefits to you in terms of even better service and quality products mass-produced to sell at lowest possible prices.

to sell at lowest possible prices.



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ELECTRICAL CONSTRUCTION AND MAINTENANCE

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Published for electrical contractors, industrial electricians, engineers, consultants, inspectors and motor shops. Covering engineering, installation, repair, maintenance and management, in the field of electrical construction and maintenance.

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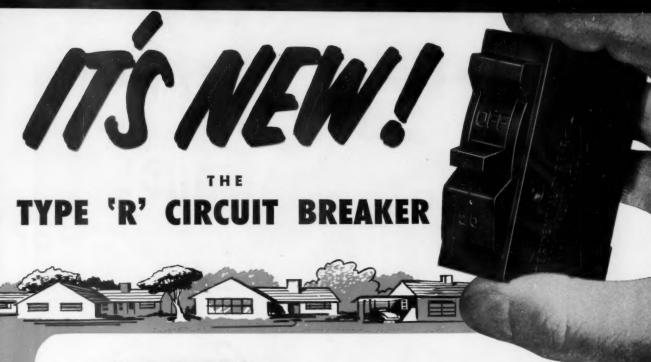
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For the Residential Market

Modern protection for modern homes! Install G-E Type "R" Circuit Breakers... priced competitively... designed for residential construction.

Type "R" Breakers are backed by the G-E name and reputation — your assurance of a safe, dependable product for your top-quality wiring job.

Use dependable Type "R" Breakers to

eliminate call-backs . . . cut out maintenance . . . give the greatest safety at the lowest possible cost.

Remember...your reputation is at stake on every wiring job you do. Don't gamble. For full specifications, write to General Electric Company, Trumbull Components Department, 42-61 Woodford Avenue, Plainville, Connecticut.

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- Maintenance-free
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- Full thermal-magnetic trip
- Easy to install . . . snaps into place
- Projecting guard protects handle
- Tamper-proof . . . factory calibrated and sealed
- Overload trip works even if handle is held ON
- Easy to see tripped breaker . . . handle moves to position marked TRIPPED

You can put your confidence in _
GENERAL ESELECTRIC



TOP THESE LOUDNESS FACTORS (Edwards 115 volt AC Adaptahorn)

type	decibels*	loudness units
flush	94	52,000
projector	91	40,000
grille	98	80,000
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PROJECTOR TYPE

(Flush type horn also available)

Only Edwards New Adaptahorn Offers All these Profit-Making Features

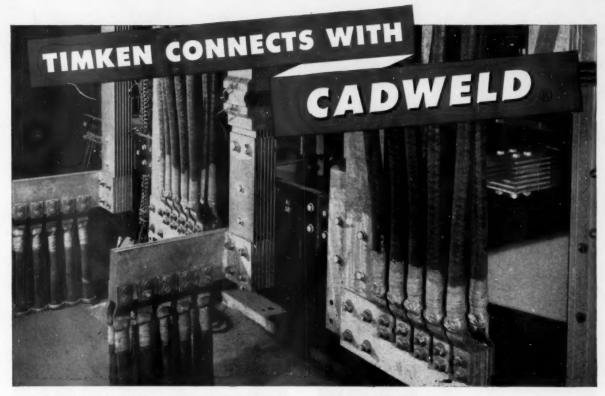
- 1. Outstanding finish and appearance.
- 2. Greater carrying tone at minimum
- 3. Rugged, shock-proof . . . die-cast housing.
- 4. Non-adjusting. Subjected to severe life tests without failure or need for adjustment.
- 5. Muting feature standard in all
- 5. Interchangeable with 6" and 10" Adaptabels on same mounting plate.
- 7. Weatherproof construction.
- 8. Front wiring and plug-in type connection . . . No "juggling" when installing.
- 9. Elongated mounting holes for easy
- 10. Female receptacle on mounting plate eliminates exposed "hot" points.
- 11. Can be mounted on all standard outlet boxes.
- 12. Listed by Underwriters'Laboratories.

The Edwards ADAPTAHORN is tops in performance, economy, appearance! From a whisper to a BELLOW-or for any sound intensity in between-the Adaptahorn never changes decibels once it's set. This powerful Grille type horn is ideal where sound coverage over wide areas is needed!

Easy to install . . . easy to adjust . . . sealed in mechanism (no clogging from dust and dirt) . . . heavy-duty, long-lasting movement. Made of rugged zinc die-casting-no other horn can match Adaptahorn's durability with such low cost.

Let Edwards' 82 years of experience work for you! Install Edwards new Adaptahorn for your next signal job. There's no horn like it! For proof, write Dept. EC-6, Edwards Company, Inc., Norwalk, Conn.

communication and protection products



THE TIMKEN ROLLER BEARING COMPANY of Canton, Ohio, used CADWELD electrical connections on the installation of their new power panel. 1000 MCM cables were CADWELDED to $\frac{3}{8} \times 2^{\prime\prime}$ offset lugs. The panel controls a 2000 H.P. constant potential DC motor driving the Assel Elongator Mill. The upper cables lead to the main DC supply bus while those at the bottom go direct to the 2000 H.P. Motor.

CADWELD connections were used for four main reasons:

- 1. They cannot loosen or corrode.
- They have a greater current carrying capacity than the cable itself.
- 3. They are small in outside diameter and meet the space limitation requirements.
- The equipment necessary to make the CADWELD connections is portable, therefore connections could be made at final assembly point.

For the best in ELECTRICAL CONNECTIONS

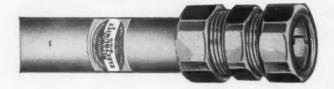


ZONE

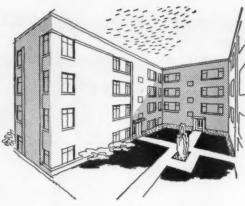
STATE



ADDRESS







Above: Mozart Street & Rosemont Ave. 22 apartments.

Left: 2950-54 West Arthur Ave. 16 apartments.

Architect: Bernard Krauss, Chicago.

Owner: Robin Construction Co., Chicago.

Electrical Contractor: Maron Electric Co., Chicago.

Distributor: Bright Electrical Supply Co., Chicago.



Eliminates threading. Box connectors make it easy to attach and line up runs with the box location.



Accurate bends are made right where they're needed, using the "Inch-Marks" on the tubing and the handy reference marks on the bender.



Here's where Republic "INCH-MARKED" METALLIC TUBING

Saves

When the job goes in easier, you save. And that's what happens when you use Republic "Inch-Marked®" Electrical Metallic Tubing.

Electricians can make accurate bends where they're needed, right on the spot. The "Inch-Marks" on the tubing match the handy reference marks on the Republic Calibrated Bender. And the result is smooth, accurate bends that fit neatly. Exclusive *Inside-Knurling* makes wire-pulling easier.

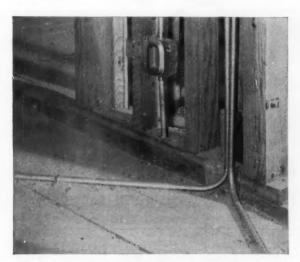
And here's another saving. No threads to cut. Threadless fittings, connectors and couplings make tight joints. No need to turn the whole run, either. And that's especially helpful in cramped quarters.

Add up all these advantages and see how you can save on installation costs. If you want proof, specify Republic "Inch-Marked" on your next buy. Your next job will tell the story.

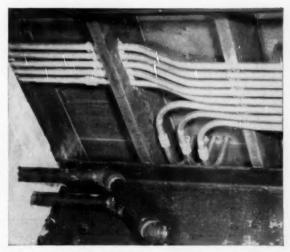
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Steel and Tubes Division
212 East 131st Street, Cleveland 8, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, New York

REPUBLIC ELECTRUNITE E.M.T.



"Inch-Marks" on Republic E.M.T. help make accurate bends fit, especially in close quarters. Bends are smooth, fit neatly.



It's easier to install multiple runs in cramped spaces. Runs are easily lined up according to plan. An experienced journeyman can turn out a neat job.

LIFE LINES





Lifelines of Priceless Service...the Breeches Buoy...the Electrical Underground Cables!

Public utilities, municipalities and electrical contractors everywhere rely on ORANGEBURG FIBRE CONDUIT to protect their lifelines — keep them healthy and long-lived.

The Many Advantages of Using Orangeburg Fibre Conduit

- It is non-metallic no corrosion.
- Its impermeable wall and tight joints keep the ground waters out.
- Its smooth bore and low coefficient of friction safeguard the cable sheaths from abrasion when pulled in — and later from cable
- Orangeburg is strong and tough gives without breaking.
- · Service records go back 61 years.

ORANGEBURG with its long lightweight lengths, easily assembled joints, angle couplings, bends, and other standard fittings, simplifies installations.

For complete cable protection at lowest possible cost be sure to specify Orangeburg Fibre Conduit. For more complete information send to Dept. EC54.

ORANGEBURG MANUFACTURING CO., INC.
ORANGEBURG, NEW YORK
West Coast Plant. Newark. Calif.





ORANGEBURG CONDUIT

STANDARD with concrete

NOCRETE without concrete



DISTRIBUTORS, ORANGEBURG FIBRE CONDUIT GraybaR

BRANCHES AND STOCKS IN PRINCIPAL CITIES



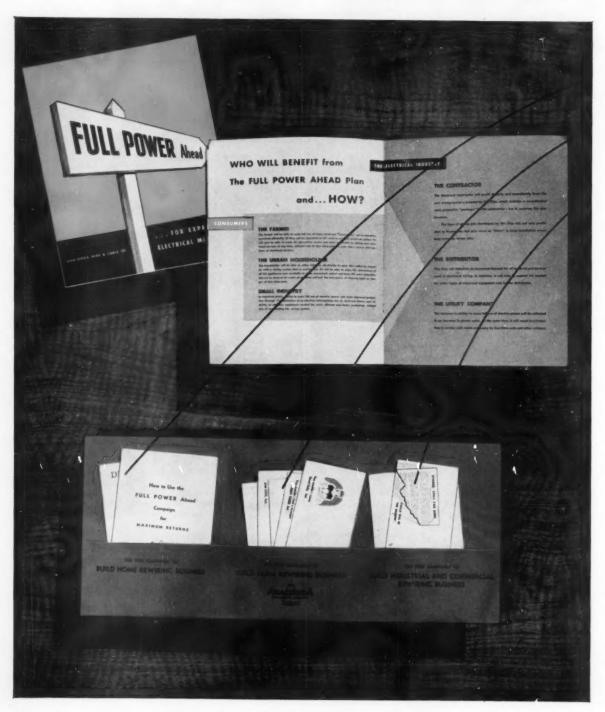
INTEGRAL AND FRACTIONAL HORSEPOWER MOTORS ARE AVAILABLE IN A WIDE RANGE OF TYPES AND SIZES

your conditions . . . Diehl will design and build to match.

City.

Now! another* new Anaconda program to help you...

GET MORE



BUSINESS HOMES FARMS SMALL INDUSTRIALS COMMERCIAL ENTERPRISES

"REWIRE NOW!" is theme of new FULL POWER AHEAD Campaign. FREE promotion tools are ready to help you get your share of today's MULTI-BILLION-DOLLAR wiring modernization market.

Here's your market. Millions of buildings are more than 10 years old. Their wiring systems were barely adequate when installed and have not been improved since. Now add a steady growth in the uses of electricity. You can see that this market is ripe for aggressive electrical contractors.

3 business-building jobs the FULL-POWER AHEAD Campaign does for electrical contractors

(1) It helps you show consumers — your customers — why they should modernize their wiring for unrestricted use of electrical equipment.

(2) It helps *you* show them how they can easily afford electrical modernization.

(3) It helps *you* persuade them to take the first step towards electrical modernization — consulting you, the electrical contractor.

Here's how Anaconda helps you develop this profitable new business

Anaconda has prepared a special,

hard-hitting "Tool Kit." This contains everything you need to build business through the FULL POWER AHEAD Program.

You get — at no cost — a series of powerful promotion campaigns. Each sells one market — homes, farms, small factories and commercial buildings. The kit contains information about Property Improvement Loans, under FHA Title I, which help break down the "can't afford it" line of resistance... help clinch the sale. It gives helpful suggestions on how to compile mailing lists and follow-through on inquiries. Full instructions on ordering, imprinting and mailing campaign literature are also included.

Here's how you can obtain this sales promotion package

You'll want your kit as soon as possible. With it, you can turn up new business... more business. See your Anaconda Distributor for your free "Tool Kit"...and for information about the new FULL

POWER AHEAD Campaign. A lot of rewiring contracts will result from this campaign. Make sure you get your share. Act today. Anaconda Wire & Cable Co., 25 Broadway, New York 4, N. Y.

GET MORE BUSINESS FROM LARGE INDUSTRIALS, TOO!

Anaconda has reactivated the successful Power-up Campaign. It tells industrial plant executives that there never was a better time than now to modernize plant wiring systems — and that you can help them do it. Ask your Anaconda Distributor for your free "Contractor Sales Kit"...and cash in on the new business this campaign develops.

ANACONDA

Primary and secondary distribution cable

• building, machine tool, control and communication wire

• portable cords and cables

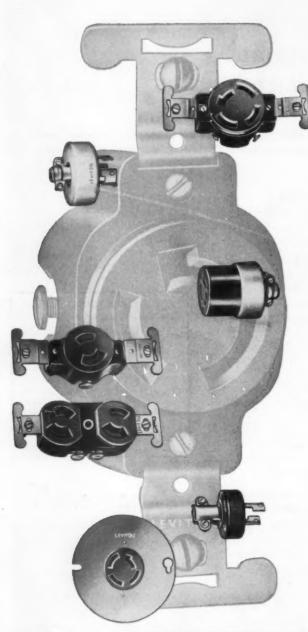
• bus-drop cables

• apparatus cables

• copper, aluminum, copperweld conductors

• wire and cable accessories.

^{*}Once again Anaconda takes the lead in industry-wide promotion campaigns. 1936 – Industrial Modernization. 1941 – Preventive Maintenance. 1946 – Wire Ahead. 1950 – Power-Up – And Be Prepared. 1953 – Full Power Ahead.



LEV-0-LOCK devices are available in 2-3-4 wire caps, connectors and receptacles in 10 and 20 Amp ratings. Approved by Underwriters' Laboratories.



. providing safe
dependable connections
under severest conditions
of vibration, motion or
accidental pull-out.



These new LEV-0-LOCK devices incorporate every up-to-the-minute advance in design and engineering. Just a turn of the cap provides a secure connection that will not shake loose . . . that assures uninterrupted power flow. LEV-O-LOCK devices are a must for factories. offices, farms, ships; in the operation of portable power tools, machinery and office equipment. New features include double wiping contacts in all receptacles, made of heavy gauge phosphor bronze. Extra large terminal screws and ample room make wiring fast and easy. Rigid quality control from raw material to final inspection is your assurance of a superior product. Send for bulletins LL and NPB 16.



MANUFACTURING COMPANY

Brooklyn 22, N. Y. • Chicago and Los Angeles LEVITON (CANADA) LIMITED, MONTREAL



BUILDERS ARE PRESOLD ON Stablok ...

it's a "millions-proved" sales feature

YOU DON'T have to talk an arm off a builder to sell him Stab-lok Circuit Breakers. Builders are already sold. They've found that modern circuit protection really helps sell homes ... and that Stab-lok costs only pennies more than fuse boxes. Besides that, Stab-lok dependability is unquestioned. More Stab-loks are being installed today than all other breakers combined ... millions of them are in service.

And as if that weren't enough, look at these other Stab-lok advantages!

Across-the-board economy-Stab-lok costs less when you buy it; less to install; less when you have to change or add circuits.

Widest line of enclosures - Stab-lok enables you to meet

every sort of specification for circuit breaker protection.

Amazing flexibility—Magic "E" and sequenced bussing, plus the standard NA, the half-inch NC, and the double pole (simultaneous trip) Stab-lok breakers provide flexibility unapproached by any other system.

Nationwide distribution—No matter where you're located, Stab-lok breakers and enclosures are available at nearby jobbers' for immediate delivery.

Sell Stab-lok to all your prospects...and remember builders are the biggest buyers! And write for the Magic "E" booklet that brings the whole Stab-lok story up to date. Federal Electric Products Company, 50 Paris Street, Newark 5, New Jersey.



FEDERAL & PACIFIC

ELECTRIC PRODUCTS COMPANY

ELECTRIC MANUFACTURING CORP



Federal products: Stab-lok Circuit Breakers, Motor Controls, Safety Switches, Service Equipment, Industrial Circuit Breakers, Panelboards, Switchboards, Control Centers, Bus Duct — Pacific Electric products: High voltage circuit breakers and power switches * Sales offices in principal cities.

tools that

Streamline electrical

maintenance

FOR POWER PROBLEMS...



FOR ELECTRONIC TROUBLE SHOOTING...



WESTON INDUSTRIAL CIRCUIT TESTER (Model 785) the versatile 28 range super-sensitive portable tester.

Especially designed for checking electronic control and power equipment. Seven d-c voltage ranges: .1 to 1000 (20,000 ohms per volt) ...six a-c voltage ranges: 5 to 750 (1000 ohms per volt) ...six d-c current ranges: 50 microamperes to 10 amperes ... four a-c current ranges: .5 to 10 amperes ... five resistance ranges: 3000 ohms to 30 megohms ... all ranges full scale ... a-c and d-c current ranges extended with external transformer or shunts. New temperature compensated rectifier circuit gives greater a-c accuracy.

WESTON CLAMP VOLT-AMMETER (Model 633) measures current and voltage without breaking circuits and disrupting operations.

Combines in one instrument five full-scale a-c current ranges of 1000/250/100/25/10 amperes with range overlap for good readability . . . three self-contained a-c voltage ranges of 700/350/-175 volts, with instrument insulated for 750 volt service. Has convenient 6-position thumb switch for range selection, and adjustable pointer stop for measuring motor starting current.

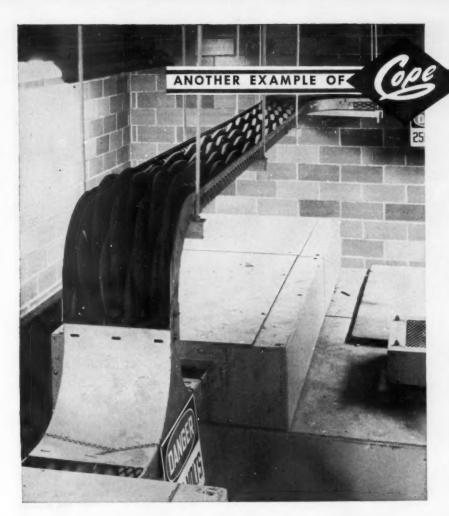
WESTON A-C INDUSTRIAL ANALYZER (Model 639) a combined Voltmeter, Wattmeter, Power Factor Meter, Ammeter . . . all interconnections madel

A real timesaver because only one hook-up is necessary to measure a-c current, voltage and power in single and polyphase circuits, as well as power factor in 3 phase, 3 wire, balanced circuits. Adequately insulated binding posts . . . high overload capacity. Furnished in compact oak carrying case measuring only 18%" x10%"x6%".

AVAILABLE THROUGH LEADING DISTRIBUTORS

WESTON Instruments

WESTON Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J.



EFFICIENCY ...

A SINGLE RUN OF COPE CABLE TROUGH CAN DO A MAN-SIZED JOB

The above photograph, taken in a section of the new Scott Paper Co. plant at Everett, Washington shows one run of Cope Cable Trough carrying four sets of three phase triplexed cable carrying 2300 volts properly spaced to give a free-air rating.

Because of its low cost and ease of installation, Cope Cable Trough is extremely popular as a standardized system for supporting power and control circuits in the industrial and utility field.

Cope Cable Trough is available in straight runs and a wide range of fittings (tees, elbows, drop-outs, etc.) which enables the entire system to be quickly and easily erected at the job site to conform to any layout.

Write today for further information. Ask for Bulletin 6M.



You know Cope by these products

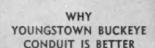




T. J. COPE, INC.

711 SOUTH 50th ST., PHILADELPHIA 43, PA.

No strain in bending



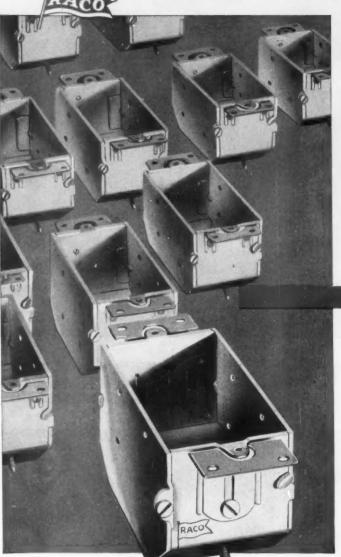
Youngstown is the one manufacturer who makes rigid steel conduit from ore to finished product. This enables Youngstown to control the complete manufacturing process—your insurance that each length of "Buckeye" is made of top-grade steel.

• Any electrician recognizes Youngstown rigid steel conduit the moment he starts to bend it. He'll tell you that Buckeye is easier and faster to bend than any other kind. This means you save hours of labor with Youngstown Buckeye Conduit.

THE YOUNGSTOWN SHEET AND TUBE COMPANY Carbon, Alloy and Yoloy Steel

General Offices: Youngstown, Ohio - Export Office: 500 Fifth Avenue, New York 36, N. Y. SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - BAR SHAPES - WIRE - HOT BOLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - BAILROAD TEACK SPIKES

You can always rely on RACO



ELECTRICAL BOXES MAY LOOK ALIKE...

Only RACO Assures
You All these Benefits

mechanical details

carefully engineered in excess of national and local code requirements.

electrolytic zinc plating

with a fine clean, neat appearing permanent silvery finish.

best materials

full gauge steel . . . excellent screws . . . precision-fit covers and clamps.

superior service

Your order receives immediate attention at Raco... Scheduled for shipment at once.

efficient packaging

for easy handling, storage and inventorying. In hard fiber cartons approved for export.

complete line

of all types and sizes of switch and outlet boxes, covers, clamps, bar hangers, brackets.

new RACO switch box grippers

Install any type box with plaster ears in any type of wall in a few seconds. Save time, save money.

write department EC for complete information

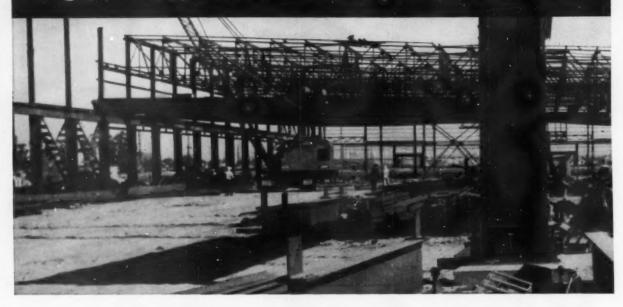
"A BOX FOR EVERY NEED"



RACO

ALL-STEEL EQUIPMENT INC., Aurora, Illinois

For "On-The-Job" Technical



IT PAYS TO SEE A PHELPS







DODGE DISTRIBUTOR!

Phelps Dodge Distributor Service Helps Facilitate Job Planning, Minimize Job Problems

Specifying Habirshaw wire and cable, made by Phelps Dodge Copper Products Corporation, assures you of two highly important advantages: (1) top quality cable—the finest in materials and workmanship, and (2) expert advice from Phelps Dodge's experienced engineering staff. These are two major reasons why it will pay you to rely on Phelps Dodge!

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CORPORATION

WIRE BY PHELPS DODGE MEANS WIRED FOR LIFE!



the Wagner Cartridge Bearing Design cuts your maintenance costs:

Bearings are protected at all times. The Wagner design completely encloses the bearings in a sealed cartridge. Labyrinth seals prevent the entrance of water, dirt and other foreign material. Even when the motor is disassembled, the cartridge remains intact as part of the rotor shaft. The bearing housing stays completely enclosed for full protection against dirt and dust.

Wagner Bearings can be relubricated. When lubrication is necessary to forestall premature bearing

failure in unusually severe applications, readily accessible lubrication openings permit addition of grease or complete relubrication.

Wagner Bearings run longer between grease periods. Hot bearings shorten grease life. Wagner bearings have a low temperature rise because the design incorporates a deflector shield that directs a cooling stream of air around the bearing housing. Bearings run cooler and longer between maintenance periods.

This cartridge bearing design is a feature of the entire Wagner line of totally-enclosed fan-cooled motors. The line includes standard and explosion-proof steel frame motors, and standard and explosion-proof cast iron frame motors. All types are available with normal torque or high torque characteristics, in ratings to 250 hp.

For complete information—just call the nearest of our 32 branch offices, or write for Bulletins MU-132 and MU-196.



WAGNER ELECTRIC CORPORATION
6413 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S.A.

TRANSFORMERS
INDUSTRIAL BRAKES
AUTOMOTIVE
BRAKE SYSTEMS—
AIR AND HYDRAULIC

ELECTRIC MOTORS

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M54-16

CRESCENT GRAY CRESFLEX

NONMETALLIC
SHEATHED
CABLE

CRESFLEX Type NM is the most suitable and lowest cost interior wiring system for all farm and rural residential buildings.

- CLEAN OUTSIDE SURFACE. The outside is finished with a gray paint to prevent the marking of walls.
- LASTING QUALITY. A rot-proof thoroughly saturated fiberglass overall braid is used.
- CLEAN INDIVIDUAL CONDUCTORS. A treated paper dam prevents saturant from reaching paperarmored conductors.
- EASY WORKING, because paper armor pulls off easily and the Thermoplastic insulation strips free and clean.

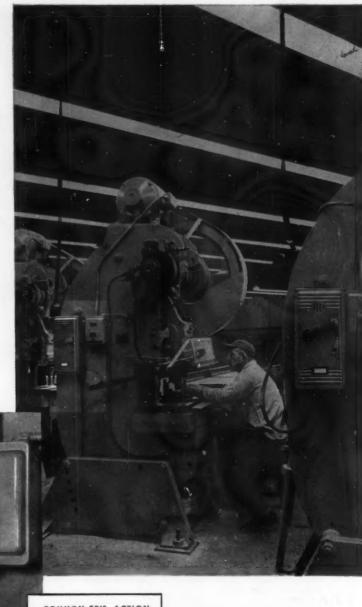


CRESFLEX is available from your ELECTRICAL WHOLESALER'S stock.

OVER 70 VEARS EXPERIENCE

CRESCENT INSULATED WIRE & CABLE CO.

Here's a good reason why
It's wise to buy
On over-all cost...
not price





Common tripper bar opens all poles simultaneously when fault occurs in one pole.



Complete single-phasing protection includes I-T-E Circuit Breakers

Electric motors provide the drive for efficient, profitable production and represent costly capital equipment. As such, they must have *complete* protection.

Protection against "single-phasing" rates high on the list. A burned-out motor can prove expensive—not to mention lost production.

The plant pictured here has recognized this and installed an I-T-E Circuit Breaker in addition to the motor controller—to provide complete protection for the motor of this punch press. A fault in one phase, and the circuit breaker opens all poles simultaneously!

Remember—in electrical protection, over-all cost is the cost that counts. Check with your local I-T-E distributor, and see how much more economical modern I-T-E Circuit Breakers really are—compared with fusible-type protective devices.

I-T-E Circuit Breaker Company, 19th and Hamilton Streets, Philadelphia 30, Pa.

"TEN REASONS WHY" I-T-E CIRCUIT BREAKERS PROVIDE THE UTMOST IN MODERN CIRCUIT PROTECTION

- They offer the highest degree of safety to personnel.
- 2. They reduce production down-time.
- 3. They eliminate replacement costs and maintenance.
- 4. They are completely tamperproof.
- They are pretested to insure uniformity of operation.
- They prevent single phasing when a fault occurs.
- They safely carry their continuous current rating indefinitely.
- 8. They save mounting space.
- 9. They offer a wide range of special attachments and enclosures.
- 10. They incur low watts loss.



I-T-E CIRCUIT BREAKER CO. Philadelphia, Penna.

The other side of this handy pocket card tells you how to select I-T-E Molded Case Circuit Breakers for various feeder and branch circuits. Write for card and other application data, or see your local I-T-E Distributor.

I-T-E Individually Enclosed Circuit Breakers



For many years Contractors from Coast to Coast have used Briegel All Steel Indenter Fittings. U. L. approved as concretetight and for general use, B-M Indenter Fittings are faster, easier to use and neater in appearance.

Cross Section Showing Indentations. Installation is simple and less expensive. Two quick squeezes sets them forever. Try B-M Indenter Fittings and get more profits from each job!



BRIEGEL METHOD TOOL CO.

Warehouse Stocks in Principal Cities for Immediate Delivery!

a vital

safety factor

in this new school

Just how important is conduit in the construction of a new high school . . . or any new school? Conduit protects the fire alarm system, the normal and emergency lighting systems, power circuits, public address system, and other electrical wiring systems which are so vital to the safety and smooth operation of a school building.

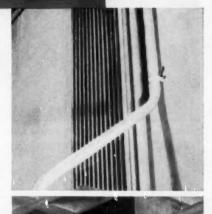
That's why the architects and contractors who built Donegal High School, Lancaster County, Pa., chose top-quality Spang Conduit. They knew it was essential to use the best conduit to assure a safe, reliable wiring system.

Why is Spang Conduit recognized by architects and contractors as the top-quality conduit? Because Spang Conduit is quality controlled throughout manufacture and doubly inspected before shipment. This assures you of a consistently good product for any installation.

It also means Spang Conduit is easy to cut, thread, bend and weld . . . easy to install. This saves time on installations and means more profits for you.

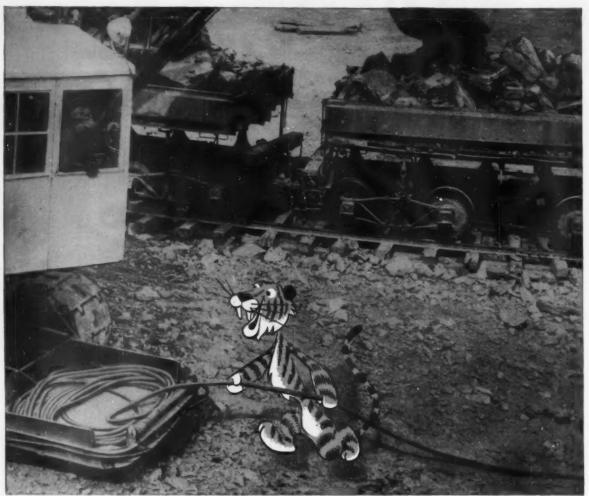
Next time you buy conduit, buy Spang. Take your choice of Spang Hot Dipped, Spang Black or SpanGleam EMT. Write for complete information and for the name of your nearest Spang Distributor.





Owner: Donegal Joint School Authority. Lancaster County, Pa. Architects: Buchart Engineering Corporation, York, Pa. General Contractor: Herman Wohlsen's Sons, Lancaster, Pa.
Electrical Contractor: Roy S. Reidenbaugh Spang Distributor: Westinghouse Electric Supply Co.

"Our Tiger Brand



NOTICE THE CABLE TRAY fastened to the shovel. This was developed by Universal Atlas for easier cable handling.



TWO WORKMAN WATCH from blast shelter as charge is set off in distance. Low horses cushion cable from shock of falling rock.



HERE A CABLE is raised on horses to clear the railroad track. It feeds the shovel visible in background.

Amerclad lasted 12 years"

Says Chief Electrician, Hudson Plant Universal Atlas Cement Company

Year after year, at this quarry, the Amerclad is exposed to knife-sharp fragments of flying rock. During the summer, the rock often gets so hot that you can't even touch it. Other times, the cable lies out in the rain and snow—often at sub-zero temperatures.

At the Hudson, N. Y. quarry of Universal Atlas, Chief Electrician Frank Rodmond said, "This Amerclad runs the constant danger of being hit with flying rock fragments through secondary blasting. Yet the down-time cost of this operation is so high that we just can't stand cables that keep failing. We kept that last batch of Amerclad 12 years before we replaced it, yet it was still serviceable when we switched over to new Amerclad."

If you want service like this, specify Amerclad the next time you need cable that can really take it. Amerclad is available in a great many sizes and constructions, with or without shielding. There is a type to power anything from a river dredge or mine locomotive down to a rough and tumble electric hand drill. Send the coupon, and get more information.

AMERICAN STEEL & WIRE DIVISION UNITED STATES STEEL CORPORATION GENERAL OFFICES: CLEVELAND, OHIO

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UNITED STATES STEEL EXPORT COMPANY, NEW YORK



THIS IS A TYPICAL DRILL. It uses a 4-conductor No. 8 Amerciad cable.



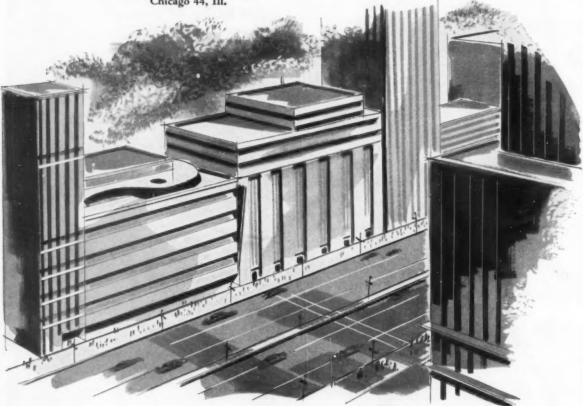
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MODERN BUILDING PLANS SPECIFY COMPLETE INTER-COM SYSTEMS

Good inter-com systems are just as accepted as a part of today's architecture as its modern design. Permanently built-in communication systems naturally include the long-life, trouble-free characteristics provided by Belden Inter-Com Cables.

There is a specialized Belden Cable for every intercom or sound system requirement.

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FOR EVERY TYPE OF INSTALLATION
FOR EVERY TYPE OF EQUIPMENT
BELDEN HAS THE CABLE BUILT TO
SPECIFICATIONS

Belden Inter-com CABLE better lighting with

GRATELITE*

NOW available in two sizes - 11"x 48" and 16"x 48"

THE SIGHT-SAVING CUBES MAKE GRATELITE GREAT:

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FUNCTIONALLY CORRECT... AESTHETICALLY BEAUTIFUL

TENS OF THOUSANDS OF GRATELITES INSTALLED. MILLIONS OF CUBICLES OF SIGHT-SAVING LIGHT

Reports from all over the nation:

"No complaints - all compliments"

"...stay unbelievably clean"

"... nothing compares to it"

"... nothing but praise for GrateLite"

It's all in the sight-saving cubesand only GrateLite has them!

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THE EDWIN F. GUTH COMPANY ST. LOUIS 3, MO.

Big Brother Contellite

for High Voltage Cable be safer... be surer with

SHIELDED KEYSTONE-HAZAPRENE

Shielding of electrical cables at voltages over 5000 volts is now generally recommended. By equalizing voltage stresses and preventing the formation of corona, shielding guards the life of the rubber insulation. It also prevents surface discharges, thus protecting men who handle the cable.

One of the important advantages of Shielded Keystone-Hazaprene over other such cables is in the controlled application of the copper shielding tape. In Shielded Keystone-Hazaprene this tape—as well as the auxiliary paper and cable tapes-is applied with constantly controlled tension, the most successful means of preventing undesirable physical stresses within the cable. Case histories have proved the proper application of shielding tape to be a very important factor in the service life of high voltage rubber-insulated cable.

This exclusive Hazard feature, combined with the toughness of the mold-cured Hazaprene sheath and the stability of the Keystone insulation, provides a high degree of dependability, long service life and operating economy.

For transmission and distribution circuits, generator and transformer leads, test leads and similar uses, you'll use shielded cable for 5001 volts and up. And to protect personnel and vital electrical circuits, be safer and surer by specifying Shielded Keystone-Hazaprene. Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pennsylvania.







ZARD insulated cables

FINANCIAL AID TO HIGHER EDUCATION

What Business Can Do to Help Our Colleges and Universities

Is the financial squeeze now gripping our colleges and universities grave enough to warrant direct action by the business community? If so, what can business do about it? This editorial is addressed to these two questions.

In the previous editorial in this series of two, it was demonstrated that our colleges and universities, and particularly the independent institutions, face financial difficulties, which, unless relieved, promise to get progressively worse and might ultimately result in a national disaster. This state of affairs obviously gives the business community a crucial stake in helping to relieve the plight of these institutions. For our business organizations can be no stronger than the total community of which they are a part.

It does not follow automatically, however, that every business firm should give direct financial aid to education. Already the business structure is heavily burdened with activities unrelated to its main purpose. These include acting as tax collector for more than \$65 billion of federal, state and local taxes in the year 1953. There is a limit to the amount of such public enterprise that can be loaded on the business system.

Business Holds Key to Answer

If, however, the survival of a key part of our educational system depends on its having financial help from the business community, that help should be provided. And this is the situation of our independent privately endowed colleges and universities.

Of course, our tax-supported institutions of higher learning must also be kept strong, financially and otherwise. But they have recourse to public support not available to the independent institutions. Largely on this account, their present financial difficulties are much less acute than those of the independent colleges and universities.

These independent institutions have seen price inflation eat away much of the value of their endowments. Moreover, there is no prospect that these endowments can be sufficiently replenished by gifts from the wealthy people who provided them in earlier years. Progressive income and estate taxes have seen to that. Thus, they are faced not only with a peculiarly acute financial problem, but also one which cannot be solved except by tapping other sources of aid.

Tax Support No Solution

It is conceivable that the independent colleges and universities might solve their financial problem by seeking support from tax revenues. If they did this, however, they would lose their distinctive character as independent institutions, and our system of higher education would lose one of its major elements of strength. That is the existence in our educational system of both independently financed and tax-supported colleges and universities. Each has its special contribution to make to a well-balanced system of higher education.

Business is directly dependent upon higher education to staff its increasingly complex and exacting operations. A key part in this process is played by the small, independent liberal arts colleges which are the hardest hit financially of all our institutions of higher learning. "These," states the Council for Financial Aid to Education, recently formed by a group of business leaders, "have contributed a high proportion of the intellectual, scientific and religious, as well as business leadership of the nation. Their programs are devoted to the teaching of values, particularly the values of freedom. They are a vital bulwark to our system of free enterprise."

Means of Providing Help

There are many means by which business firms can extend help to our colleges and universities. The most obvious, of course, is to make outright grants of money either to individual institutions or to groups of institutions for such uses as the institutions think best. Another means of help, increasingly employed by business firms, is to establish scholarships to pay the full cost of college or university courses of study. Sometimes the scholarships are open for general competition, sometimes they are limited to employees and children of employees of the firm granting them. Not infrequently those winning the scholarships spend some part of their school vacations working in the companies granting the scholarships.

A number of companies have recently provided for what have come to be called "scholar-ships in reverse." These companies pay a flat sum to a college or university for every one of its graduates they employ. Financing of university research programs also offers a broad avenue for financial aid to our universities by business.

Need Two-Way Communication

Some business firms have well-developed programs for financial aid to education. But they are exceptional. For most companies the problems involved are new and strange. These companies were created with the basic purpose to make money, not to give it away. Successful philanthopic operations involve a whole set of

problems with which they have very little experience. Not the least of these is how to make business a dependable source of financial aid to education, since business has no assurance that the profits of one year will not be losses the next.

Considerations such as these emphasize the wisdom of a recent Industry-College Conference on aid to higher education by business, in making the first of its ten conclusions that "better communication, by direct contact, is needed for each [industry and the colleges] to understand the problems of the other." At this juncture the creation of mutual understanding is much more important than the raising of some money and letting it go at that. The problem of aid to education by business has its immediate urgency, but there is also a long-range program to be developed on which business and the colleges and universities must pull together in the years ahead to find a satisfactory solution.

As stated at the outset, failure to find a satisfactory solution could result in a national disaster. This means that, to give proper heed to their own future prosperity and the future welfare of the nation, business firms generally must go to work on the problem of financial aid to higher education. They must go to work first, to understand the problem; second, to establish two-way communication with our colleges and universities about it; and third, to develop a program which pays proper heed to the needs and capabilities of both business and higher education.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

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Donald Chillyraw

PRESIDENT

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EASIER TO SERVICE, clipped or taped terminals always can be read. You save hooking-up time.

EASY ACCESS CONDUIT BOX



LARGE CONDUIT BOX is diagonally split-gives you ample knuckle room for easier wiring.

60% MORE PROTECTION



MORE FULLY PROTECTED motor achieved through redesign of cast iron frame and end shields.

LONGER MOTOR LIFE



NEW BEARING SYSTEM means the G-E motor runs longer without relubrication than any other.



Now, easier installation, less maintenance...

G.E.'s new TRI 55 CLAD motor you can install it and forget it!

The all-new General Electric Tri/Clad '55' motor is specially engineered to reduce your installation costs . . . and run longer, without attention, than ordinary motors. This new motor gives you 60% more physical protection plus longer electrical life. In addition, a bearing system designed to use the most modern greases means you will not have to regrease the Tri/Clad '55' for years.

You save with the new Tri/Clad '55' because wiring is easier and faster. The large, diagonally split conduit box gives you plenty of knuckle room. Leads are perma-numbered . . . you can always identify them

instantly.

The new Tri/Clad '55' also brings you important handling, storing and installing economies. Better use of space within the frame means a 30% reduction in size and weight in some ratings. Yet active materials (magnetic steel and copper) are not sacrificed.

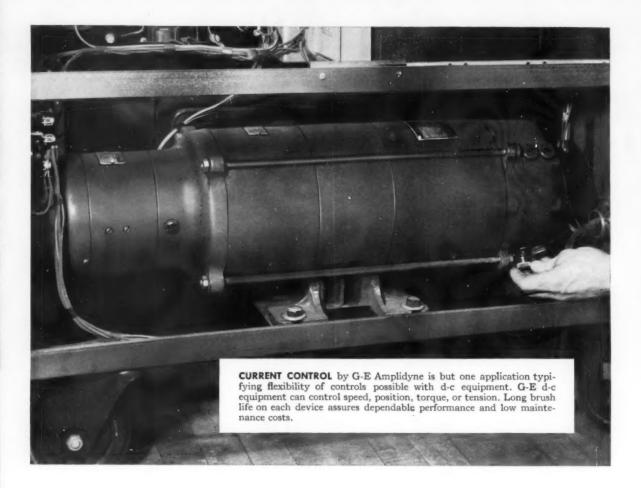
General Electric Tri/Clad '55' motors are now available in many ratings. The complete line of 1 to 30 hp a-c motors will be available soon. For 'ull details contact your G-E Apparatus Sales Office or G-E Motor Supplier today. Write for Tri/Clad '55' bulletins GEA-6013-Dripproof motors, GEA-6012—Enclosed motors, GEA-6027—Gear-motors, General Electric Company, Section 648-7, Schenectady 5, N. Y.

Trogress is our most important product

GENERAL (%)



ELECTRIC



Use G-E amplidynes for accurate process control

G-E AMPLIDYNES, like the one shown above, are versatile d-c power amplifiers with near-instantaneous response—designed to give fast, accurate control of position, current, voltage, speed or tension.

Versatility of d-c equipment gives you more effective and economical use of your expensive production machinery. For example, wide speed range is readily available because of the adjustable-speed characteristics of direct-current motors; other G-E d-c products like amplidynes, tachometer generators, motor-generator sets, and Thy-mo-trol* drives can help you solve even more production problems.

APPLICATION ENGINEERS at G.E. are anxious to help you get efficient control systems. For more information on this service and on d-c equipment, see your local G-E Apparatus Sales Office or Authorized G-E Distributor. General Electric Company, Schenectady 5, N. Y. 704-12

*Reg. Trademark of General Electric Co.

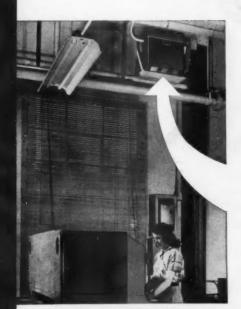




EASY INSTALLATION and easy handling are features of G-E dry-type transformers. One being installed above is a Type M,

rated .25 kva for indoor or outdoor use. Type D, rated 25 kva and up, is also available for indoor use only.

G-E dry-type transformers give you flexibility, economy, convenience



GREATER FLEXIBILITY of G-E dry-type transformers makes it possible to move them around the plant wherever they are needed and to install them in any out-of-the-way spot.

An easy way to add flexibility to your present power distribution system without changing your basic wiring system

The extreme flexibility of General Electric dry-type transformers is a great advantage in the modern plant. Machines are being moved around continually, and with dry-type transformers the proper operating voltage can be quickly obtained at the load from your established power system.

Economical—Here is a minor investment that pays off in major savings. By specifying and installing G-E dry types, you save in two ways: (1) Once installed, they require virtually no inspection or maintenance. (2) Adding dry-type transformers keeps your power system flexible to match new voltage requirements.

Convenient—G-E dry types offer a convenient method of stepping voltage down to the required level for portable tool operation.

Off-the-shelf delivery is available for most popular ratings. Whether you are stepping up, stepping down, boosting or bucking, there is a G-E drytype transformer to meet your needs. For more information, contact your G-E distributor or write for Bulletin GED-2024, General Electric Co., Section 411-117, Schenectady 5, New York.

You can put your confidence in_

GENERAL ELECTRIC

"G-E STARTERS ARE EASIEST

EASY MOUNTING. Three screws on the back of the enclosure hold the starter in place. To mount the starter just slide the slotted openings over the screws. The starter is then supported while you tighten the screws, which are easily accessible from the front. The same type mounting can be used for mounting the enclosure.

CLAMP-TYPE TER-MINALS. Solderless clamp-type terminals are easy to reach from the front. Wiring to the terminals is simplified as the terminal clamps ride out on screws. Just slide the stripped down wire under the terminal clamp and tighten down the

GENERAL (P) ELECTRIC

PANHEAD SCREWS.
Large-size panhead screws on all terminals make it easy to get a tight fit. Wide, deep slot and a hardened head take full screwdriver width, and prevent burring or screwdriver slippage.

PROTECTED COIL.
Starter coil is protected from screw-driver slips during installation. The strongbox coil, completely enclosed in plastic, won't let accidental blows, dust or moisture get at the coil.

COMPLETELY FRONT WIRED. All wiring, including the interlock and overload relays, is easily done from the front. The screwdriver goes straight into the clamp-type terminals which are completely free for your wiring since all factory wiring is to separate terminals.

TO INSTALL"

Says Gordon Smith, President of Gordon Smith and Company, Inc., Bowling Green, Kentucky

Gordon Smith and Co., Inc., manufacturer of engine and electrically driven air compressors, has standardized on G-E magnetic starters because they are reliable and easy to install. Customer satisfaction has "sold" this company on G-E starters.

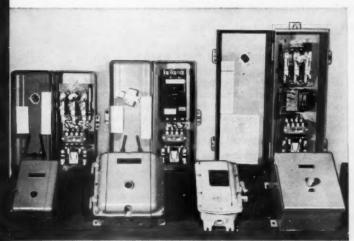
ADDITIONAL FEATURES of the magnetic starter that contribute to easy installation and reliability are knockouts in the top, back, sides and bottom of the enclosure; a permanent air gap that prevents contacts from "sticking-in"; bi-metallic overload relays that are easily adjusted for manual or automatic reset.

FOR MORE INFORMATION contact your nearest G-E Sales Office, or Distributor, or write Section 730-52, General Electric Company, Schenectady 5, N. Y.



"WE'VE NEVER HAD A CUSTOMER COMPLAINT DUE TO STARTER FAILURE," says Gordon Smith. This customer satisfaction has come from the reliable operation, ease of inspection and maintenance, and long life of General Electric magnetic starters.

FOR EVERY MOTOR-STARTING APPLICATION—A G-E MAGNETIC STARTER



NO MATTER WHAT YOUR REQUIREMENTS, you can get a G-E starter to fit your application. The complete line of enclosures includes standard, watertight, dust-tight, explosion-proof and



semidust-tight. Enclosures that meet JIC specifications are also available. Full voltage starters rated up to 200 amperes are available in NEMA sizes 00, 0, 1, 2, 3, 4 and 5.

CHOOSE FROM THE COMPLETE GENERAL-PURPOSE CONTROL LINE











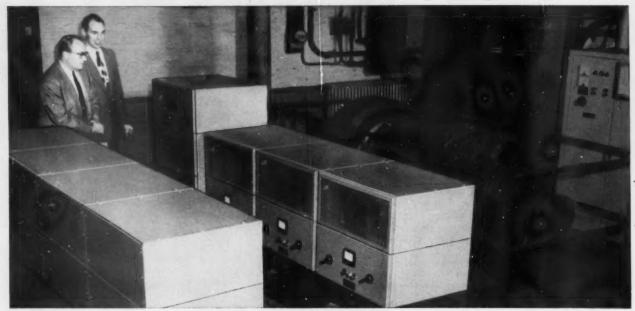






MANUAL STARTERS - MAGNETIC STARTERS - PUSH BUTTONS - COMBINATION STARTERS - RELAYS - REDUCED VOLTAGE STARTERS - SOLENOIDS - LIMIT SWITCHES

GENERAL EBELECTRIC



SUPPLYING D-C POWER for an oxygen-hydrogen plant is this installation of General Electric germanium rectifier power con-

version units. These individual units are rated 25 kw, and are combined in series-parallel totalling 150-kw output.

General Electric Announces Germanium

New 25-kw d-c power supply units operate at approximately 94 per cent efficiency between half and full rated load.

General Electric germanium rectifier power conversion units are an important new source of d-c power for industrial plants. In a number of applications they have important advantages over other types of conversion equipment, either rotating or static.

WHAT ARE THESE UNITS?

G-E germanium rectifier power conversion units are packaged equipments which economically convert alternating current to direct current near where it is to be used. They consist of a transformer, germanium rectifiers, and control equipment mounted in a sturdy metal casing. A small cooling fan is the only moving part.

WHERE ARE THEY USED?

Typical applications for germanium rectifier power conversion units are supplying power for constant speed d-c motors, or excitation current for synchronous motors. They can be used to supply direct current for magnetic chucks, brakes, and clutches, or for testing d-c equipment. They are also especially suited to electrochemical processes.

WHAT ARE THEIR ADVANTAGES?

The 94 per cent efficiency of these germanium power conversion units is their outstanding advantage. As the chart shows, they operate with this exceptional efficiency even at half load. No other type of recti-

Additional General Electric Rectifier Products to Meet Other D-C Power Requirements



SELENIUM RECTIFIER POWER SUPPLIES

Ratings 0.75 to 25 kw fit most d-c needs. With dynamic braking panel including absorbing resistor, units can be used with hoists or other regenerative loads.



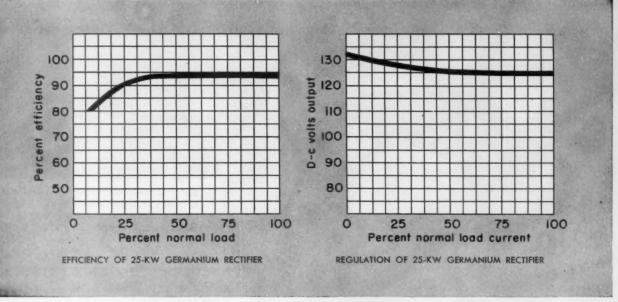
ELECTROPLATING POWER SUPPLIES

General Electric's line of plating power supplies included models for laboratories and barrel plating as well as equipment with manual or automatic regulation.



INDUSTRIAL TRUCK BATTERY CHARGERS

Reliable, easy-to-operate metallic rectifier battery chargers are available for all makes and models of electric driver-lead or driver-ride industrial trucks.



CONVERSION EFFICIENCY of new 25-kw germanium conversion units runs at about 94 per cent from half to full rated load.

VOLTAGE REGULATION of equipment is excellent. Output voltage drops only about 6 per cent between no load and full load.

Rectifier Power Conversion Equipment

fication equipment of comparable efficiency has this characteristic at this voltage and power level.

The excellent regulation of these units is shown on the chart, also. Output voltage drops only about six per cent between no load and full load. The minimum power factor of these units is 95 per cent.

Installation costs are low since no special foundations or mounting platforms are required. Units can be placed on any flat surface and after simple electrical connections have been made, they are ready to operate

Maintenance costs are practically zero because

nothing moves except the cooling fan. Germanium rectifiers do not deteriorate with use.

RATINGS

Standard germanium rectifier power conversion units are presently rated 65/125 volts, 400/200 amperes d-c. However, units may be combined in series and/or parallel where higher ratings are required.

For complete information on this newest source of d-c power for industry, contact your nearest G-E Apparatus Sales Office, or fill in the coupon for bulletin GEA-5825, Germanium Rectifier Power Conversion Units. General Electric Co., Schenectady 5, N. Y.

GENERAL ELECTRIC

*Registered trade-mark of General Electric Co.



GENERAL-PURPOSE BATTERY CHARGERS

For charging stand-by, control, signal and engine-starting batteries, General Electric makes a complete line of Tungar* and selenium general-purpose chargers.

Section C462-9, Gen Schenectady 5, N. Y	eral Electric Company	
Please send me t	he following bulletins:	
for reference	☐ planning an immediate project GEA-5825 Germanium Rectifier Power Conversion Units GEA-5638 Selenium Rectifier Power Conversion Units GEC-970 Electroplating Power Supplies GEA-5292 Automatic Chargers for Driver-ride Trucks GEC-826 General-purpose Battery Chargers	
Name		
Company		
Street		
City	State	, ,



Instruments for Preventive Maintenance

-300

-250 L -200 L 150 S

= 100 = 50



EASY RANGE SELECTOR automatically changes scales. Screw-in voltage leads cannot be pulled out accidentally, giving more protection to operator during actual tests.

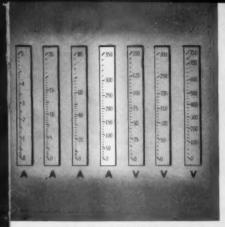
ACTUAL SIZE

This new hook-on fits your hand as well as your pocket. Only 8½ inches over-all—yet it measures current in any a-c conductor up to 2 inches in diameter! Merely 20 ounces in weight—still its mechanism is designed to accurately measure up to 750 volts or 350 amps through your choice of seven different scale ranges.

HERE ARE TWO MORE



EASY HOOK-ON INSTALLATION and fingertip range selection of the G-E hook-on wattmeter quickly determines readings in balanced 3-phase circuits.



ONLY ONE SCALE SHOWS, cutting down



HOOK IS EASILY OPENED by squeezing conpossibilities of reading errors. You have toured trigger. Insulation covering on hook rea wide range selection of seven scales with duces the possibility of grounding or short current marked black and volts red. circuiting, giving added safety to operator.



LOW PRICE includes leather case and 3½-foot screw-in leads with insulated alligator clips. Shock resistant design protects instrument in normal use.

General Electric Designs . . .

New Pocket-sized Volt-ammeter

.. with Automatic Scale Changing

The first hook-on volt-ammeter to feature automatic scale changing is the new General Electric AK-5. This feature assures you of reading the right scale every time, as you see only the scale you select on the range selector switch. Other features include a wide range of seven scales to cover almost all of your testing and

maintenance requirements. Engineers, contractors, electricians, maintenance and servicemen will find this new G-E pocket-sized hook-on ideal for balancing circuits, estimating new or revised distribution circuits, tracing faults and grounds or diagnosing operating troubles without shutting down equipment.

VERSATILE G-E HOOK-ON INSTRUMENTS FOR TESTING AND MEASURING



NO CALCULATIONS NECESSARY with this hook-on power-factor indicator. Accurate to within 0.05 PF, the AK-3 gives readings on any balanced 3-phase circuit.



ONE USE OF ALL hook-on instruments is to locate overheated motors before trouble starts. You save valuable time with these simplified instruments, featuring easy-to-read scales.

SECTION B 602-286 GENERAL ELECTRIC COMPANY SCHENECTADY 5, NEW YORK Please send me a copy of the bulletin(s)

GEC-901 AK Hook-on Indicators

☐ GEA-6104 CF-7 Hook-on Recorder

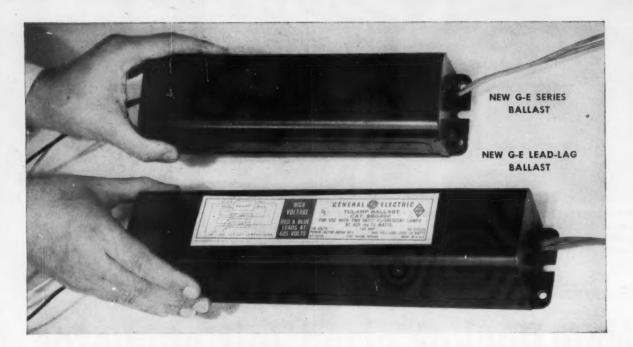
Zone State

COMPLETE INFORMATION is available on the G-E hook-on line in the free bulletins offered above. Clip the coupon and mail your request now.

GENERA



ELECTRIC



New G-E Series and Lead-lag Ballasts ... Compare and Choose for Yourself

Here is a comparison of G.E.'s two new ballasts for operation of 96T12 lamps at 425 ma. Catalog No. 89G496 is the newly designed series ballast—smaller, lighter, quieter. Catalog No. 89G490 is the similarly redesigned lead-lag ballast.

BOTH BALLASTS ARE CBM CERTIFIED and contain that full measure of extra quality which G-E engineers into every ballast, but the series ballast, by its inherent design characteristics, gives you more value for your dollar. However, if you prefer lead-lag instead of series, the new lead-lag ballast has been designed to give you the most value compared to other lead-lag ballasts.

THE SERIES BALLAST gives you equivalent performance, in accordance with lamp specifications, and offers a substantial savings in cost and size. At right is a comparison of these two General Electric ballasts. The major areas of difference are printed in bold face. You can see that the

series is less expensive, uses less line current, has less wattage loss, weighs less, is smaller, and has a quieter sound rating. Compare and choose for yourself.

For further information on either series or lead-lag ballasts, write to Section 401-6, General Electric Co., Schenectady 5. New York.

SERIES 89G496		LEAD-LAG 89G490	
73	Nominal lamp watts	73	
110-125	Circuit voltage	110-125	
60	Frequency	60	
1.55	Line Current in Amps	1.60	
.425	Lamp Current in Amps	.425	
28	Watts Loss	36	
90%	Min line power factor	90%	
\$10.15	List Price Each	\$12.60	
6	No. Units per Package	6	
65	Approximate Ship weight	74	
D	Sound Rating	E	
113/4	Over-all length	14 %	
11 9/64	Mounting Length	13 3/4	

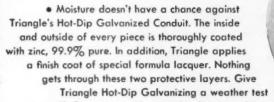
Progress is our most important product





Hot Dip

GALVANIZED INSIDE AND OUTSIDE



yourself. Compare it with any other "protected" conduit.

You will prove to yourself that nothing

You will prove to yourself that nothing else is as good as hot-dip galvanizing.

HOT DIP GALVANIZED—inside and outside!



TRIANGLE CONDUIT & CABLE CO., INC.

NEW BRUNSWICK, N. J.

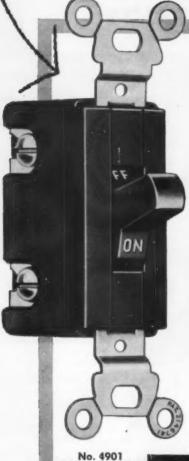
Manufacturers of Arteries for Electricity, Liquids and Gases

WIRE . CABLE . CONDUIT . PLASTIC PIPE . BRASS AND COPPER TUBE

PLANTS - NEW BRUNSWICK, N. J.: WIRE AND CABLE PLANT • ROD MILL • BRASS AND COPPER TUBE MILL • PLASTIC PIPE PLANT • MOUNDSVILLE, W. VA.: CONDUIT PLANT WAREHOUSES - BOSTON • CHARLOTTE • CHICAGO • LOS ANGELES • SAN FRANCISCO



THE BRYANT 4901 20 AMP. A.C. SWITCH LINE



FOR COMMERCIAL AND INDUSTRIAL USE

Bryant proudly announces a new, rugged, quality-built 20 Ampere A. C. Switch for heavy-duty service. Dollars and cents savings result from use at its full 20 Ampere rating on fluorescent (inductive) loads. This means twice the capacity of existing 20 Ampere switches - thus fewer switches are required - with resulting lower job costs.

OTHER APPLICATIONS

- FULL RATED CAPACITY on tungsten filament lamp loads
- IDEAL FOR MOTOR CONTROL safely handling loads up to 16 Amperes
- 4-WIRE, 480 277 VOLT NETWORK its 277 Volt rating permits use on these systems.

PLUS These Profit-Packed Features—

- UNLIMITED LIFE rugged mechanism and silver contacts assure lifetime use.
- EASY BACK WIRING full screw-clamp type terminals
- FULLY ENCLOSED in strong black plastic housing
- A COMPLETE LINE single pole, double pole, 3-way and 4-way with Brown or Ivory handles

Listed by Underwriters' Laboratories, Inc. Meets All Specifications.

Specify Bryant From Your Electrical Distributor

No. 4901 20 Amperes - 277 Volts



THE BRYANT ELECTRIC COMPANY

Bridgeport 2, Connecticut Chicago * Los Angeles

1.99906

more light toward the CEILING

means more seeing comfort BELOW!

• • • new Benjamin Diffuser-Reflector now delivers almost TWICE THE UPWARD LIGHT!

- increases brightness control for greater uniformity of light
- eliminates annoying shadows that distract from work
- reduces contrasts that can cause eye fatigue

This improved, all-porcelain-enamel Benjamin Diffuser Reflector enables you to utilize highest light levels and still enjoy comfortable seeing conditions, without materially reducing lighting efficiency.

The answer lies in a series of 14 apertures, located on the top of the reflector, 7 above each lamp. Together, they direct 12.6%* of the light toward the ceiling. This greater upward light helps relieve disturbing contrasts between upper and lower room areas. It wraps the entire room in uniform illumination, so important in reducing eye strain and fatigue caused by excessive brightness contrast. For further details and lighting data, send for Data Bulletin. Benjamin Electric Mfg. Co., Dept. H, Des Plaines, Illinois.

*for 2-lamp units. 10.7% for 3-lamp units. As compared with 6.7% and 5.8% respectively, delivered by previous Benjamin diffuser-reflectors.

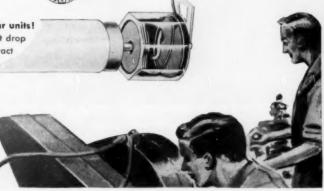
... and of course, it has "SPRINGLOX," the exclusive, metal-clad lampholder!

distinguishes Benjamin Diffuser-Reflector from all similar units! cuts out-of-service time due to socket failure...lamps cannot drop out or be shaken loose...never fails to make electrical contact the first time...patented spring construction is the secret!



Diffuser-Reflector

Sold exclusively through electrical distributors available in open-end and closed-end units, for single or bi-pin lamps,

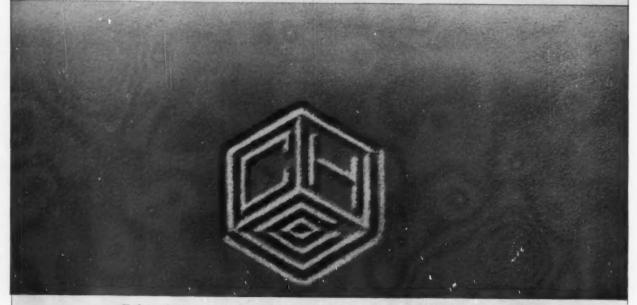


7B-260J

When you ask for

CROUSE-HINDS LB 777 CONDULET

Enlarged view showing how Crouse-Hinds trademark CONDULET is cast right into the body of Condulets for your protection. No other manufacturer can use this trademark.



Enlarged view that shows how the Crouse-Hinds Company cube trademark is cast into the body of Condulets or other Crouse-Hinds products. This is an assurance that you are getting Crouse-Hinds quality.

CONDULETS

TRAFFIC SIGNALS

CONDULETS... be sure that you get CONDULETS*

There is no substitute for CONDULET quality

CONDULETS have always been of the highest quality. To maintain its position of leadership Crouse-Hinds has a large Engineering Dept. constantly developing new products to add to the CONDULET line and improving old ones. Crouse-Hinds foundry and factory have the latest mechanical improvements and modern machinery. This enables the highly skilled craftsmen to turn out a product that is tops in quality. Constant checking and testing proves that this is true.

When CONDULETS were introduced by Crouse-Hinds in 1905 they completely revolutionized electrical conduit installation practice. This newly invented line of conduit outlet bodies was so superior to anything else on the market that all electricians were soon using them. They were of such high quality that many of those early installations are still in use ... in tip-top condition.

When imitations appeared on the market, it isn't a bit surprising that many people called all conduit fittings Condulets. Of course, we appreciate this compliment, but it often leads to confusion. It can be very disappointing if you think you are getting CONDULETS and later discover that the installation was made with a product of some other manufacture.

CONDULET is not a common noun. It is a coined word registered in the U.S. Patent Office and designates a product made only by Crouse-Hinds Company.

You can be sure of getting CONDULETS by buying from one of Crouse-Hinds authorized electrical distributors. They are ready to serve you throughout the country. Ask for CONDULETS. Then look for the word CONDULET or the C-H Co, cube trademark on the body. These trademarks appear on every genuine CONDULET.

When you ask for Condulets be sure that you get CONDULETS



Type LB
Obround Condule



Type GUAC Explosion-Proof Junction Condulet



Type GUB Explosion-Proof Junction Condulet



Type FSC Tumbler Switch Condulet



Type EFS Explosion-Proof Pilot Light Condulet

* CONDULETS
are made only by

CROUSE-HINDS



Type EVA Explosion-Proof Lighting Fixture



Type AREA Plug Receptacle



Type WMK Watertight Safety Switch Condulet





CROUSE-HINDS COMPANY Syracuse 1, N. Y.

OFFICES: Birmingham—Boston—Buffalo—Chicago—Cincinnati—Cleveland—Dallas—Denver—Detroit—Houston
Indianapolis—Kansas City—Los Angeles—Milwaukee—New Orleans—New York—Philadelphia—Pittsburgh
Portland. Ore.—San Francisco—Seattle—St. Louis—St. Paul—Tulsa—Washington.

RESIDENT REPRESENTATIVES: Albany—Albanta—Baltimore—Charlotte—Corpus Christi—Reading, Pa.—Richmond, Va.—Shreveport
Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.

FLOODLIGHTS

AIRPORT LIGHTING



A hodgepodge of circuits and controls means power losses and costly maintenance. Eliminate this needless expense with a complete *integrated* General Electric secondary system. Other major advantages: increased safety, ease of relocating machinery and equipment, and reserve power capacity for your future needs.

For details write General Electric Company, Distribution Assemblies Department, Plainville, Connecticut.

G-E Lighting and Distribution Panelboards are available in a very broad range of fusible and circuit breaker types. G-E engineers can help you double the value of your investment by selection of the correct panelboard, by provision of capacity for future needs, and location for maximum efficiency in the complete system.

G-E Motor Control Centers, with instantly accessible allpurpose plug-in units, increase operating efficiency today and assure you of continuing ability to meet tomorrow's requirements.



G-E Flex-APower copper or
aluminum busway systems actually cost no
more installed than less
versatile conductors.
They can be altered,
extended, dismantled and
re-installed quickly and
easily with complete reuse of all units.



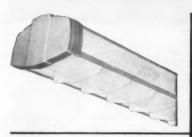
From power line to production line, make it G.E. all the way.





Supreme Market, Boston, Mass, Electrical Contractor; Massachusetts Electric Construction Company, Boston, Mass. Distributor; Graybar-Boston

Wakefield Grenadiers with Spots Do a Super Lighting Job in a Boston Super Market



The Grenadier is a finely engineered louvered unit with metal-framed plastic side panels. All metal parts finished in metallic satin. Shielding 35° normal to the lamp and 25° parallel. Stem, canopy or on-ceiling modelsfor pre-heat and Rapid Start bipin or Slimline lamps,

The owners of the Supreme Market in Boston were not willing to settle for ordinary lighting. Instead they demanded and got an over-all lighting installation which sets a new standard for super markets.

A total of 186 Wakefield twolamp Grenadiers are installed in seven continuous rows, with 123 Grenadier Spots located in line at 4 and 8 foot intervals as the situation demanded. Lamps used are CW/de Luxe. Walls above counters are painted in light pastel colors. Ceiling is aluminum. Floor is light cream terrazzo.

Here are the ft-c. readings after 200 hours of burning:

General lighting between rows, less spotlights, 50 ft-c.

Bakery shadow boxes, small, 115 ft-c. Bakery shadow boxes, large, 175 ft-c. Vegetable counters, 200 ft-c.

Displays at ends of regular goods shelves on cross aisles, 300 ft-c. on high levels; 400 ft-c. 7 feet from the floor. Dairy goods, cheese, etc., upper level, 250 ft-c.; lower level, 400 ft-c.

Ice Cream section, 300 ft-c. Frozen meat, fish, etc., 100 ft-c.

Meat cutters, 200 ft-c.

For full information, write to The F. W. Wakefield Brass Company, Vermilion, Ohio. In Canada, Wakefield Lighting Limited, London, Ontario.

Wakefield Over-ALL Lighting







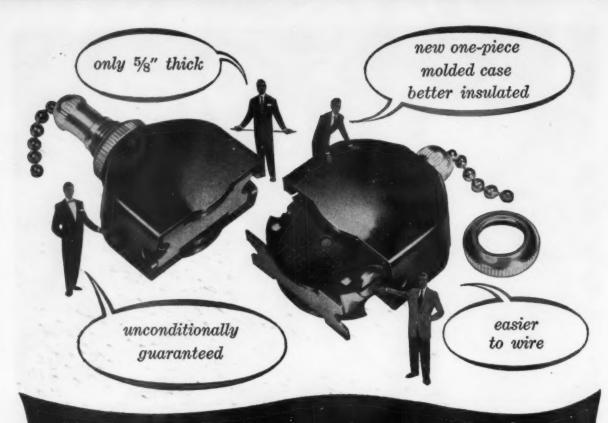












now unconditionally guaranteed no. 41 Levolier switch improved with new one-piece phenolic case

You can save money by specifying the Model 41 Levolier Switch because its use eliminates the need of replacement and reduces maintenance costs. It is the only switch unconditionally guaranteed against failure in lighting circuits. And now the Model 41 has a new rugged one-piece molded Phenolic case that provides better insulation and makes wiring easier and faster. Requires only removal of mounting nut to slip mechanism out of case and wire easily accessable terminals. Insert in case, slip lever through mounting means and replace nut. It is a 6 amp, "T", 125 volt; 3 amp, 250 volt switch, only $\frac{5}{8}$ " x $1\frac{3}{8}$ " x $1\frac{3}{8}$ ". The No. 41 insures dependable lifetime service for conduit box and canopy mounting, incandescent or fluorescent lighting and for FHP motor control. Underwriters' Laboratories Inspected,

Send for the new McGill Catalog No. 49-A describing the full line of Levolier Switches, Sockets and Lamp Guards.



McGILL MANUFACTURING COMPANY, INC. 450 N. Campbell St., Valparalso, Indiana



model 1010 10A "T" 125V

> model 71 6A "T" 125V



all are MGILL quality



model 25 6A "T" 125V Colored plastic levers



model 2020 20A 125V



4100 series Industrial socket 600 watt — 250 volt



THESE Okolite-Okoprene self-supporting aerial cables illustrate one of the most important economy features of this type of cable. At its refinery in Robinson, Illinois, The Ohio Oil Company made use of an existing pipe and conduit structure to support the Okolite-Okoprene aerial cables.

Okolite-Okoprene was widely used on this refinery installation; primary distribution from the power house to the water distribution unit substation and to the crude unit substation—in all cases the most economical use was made of existing structures.

In addition to economy in installation, Okolite-Okoprene self-supporting aerial cable provides these further advantages:

- · a higher factor of safety
- · improved voltage regulation
- less space requirements
- · high resistance to weather extremes
- high resistance to chemicals and acids common to industrial areas

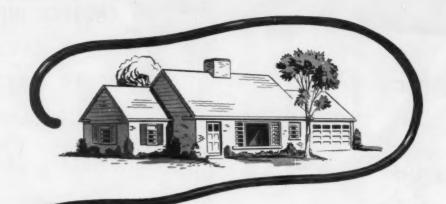
Okolite-Okoprene self-supporting cables have proved advantageous in virtually every industry in America. Write for Bulletin EC-1074, Okonite's complete data book on self-supporting cables. The Okonite Company, Passaic, New Jersey.

DESIGN, ENGINEERING, CONSTRUCTION AND PROCESSING SERVICE J. F. Pritchard & Co., 210 West 10th Street, Kansas City, Mo.



NITE SINCE 1879 insulated cables





Now...Kennecott joins your fight for adequate wiring of America's homes!

Something important is going to happen about this inadequate residential wiring problem of yours!

Look at the advertisement on the opposite page. It's the opening gun of a great, new adequate wiring campaign sponsored by Kennecott Copper Corporation.

Reaching over 15,130,000 readers of the Saturday Evening Post and This Week every month, this Kennecott campaign takes dead aim at the heart of the problem of overloaded, inadequate wiring prevailing today in over 80% of the Nation's homes!

More than that, it's a direct aid to your business, because it really sells adequate wiring and re-wiring to your prospects and to your customers!

Want To Tie In?

Would you like to key your own local promotions to this Kennecott campaign? Would you like reprints of the ads? Would you like to have blow-ups of these ads poster-size?

Write Kennecott Copper Corporation, 161 East 42nd Street, New York 17, N. Y.

Let's work together for adequate wiring!



Why couldn't it do that before?

What WAS the matter with this lady's toaster? Nothing at all. It just wasn't getting the power

it needed! Why not? Simply because the wiring in the lady's house wasn't large enough to carry the necessary electricity to her toaster as well as to the many other appliances she uses.

But, as you can see from the lady's face, she did something about it. So can you, if your house is suffering from the same electrical troubles. And it's 4 to I that it is!

For instance, if your home was built more than 10 years ago, you can be positive that its original wiring cannot care for all the appliances you've bought these past few years. In fact, even a bra ulnew house may be electrically unfit to handle the load of all the appliances you now own!

How can you tell if your home wiring needs attention? In addition to poorly-operating appliances: Dimming of lights when you operate appliances; Slow heating of toaster, iron, etc.; Frequent blowing of fuses; Poor TV reception when appliances are in use; Too few outlets and switches where you need them.

If you find these symptoms in your home, you can be sure that you are putting up with more than inconvenience. You're also losing money in wasted current. You're risking fire from under-sized, overloaded, overheated wires!

Why take chances? Ask your local electrician for an electrical check-up!

Look To Your Electricity!

If you own a house, see your electrician. He will gladly make a study of your wiring system, tell you what work if any may be needed, and its cost.

If you plan to buy a house, don't forget to check up on the age and capacity of its wiring. Better still, have an electrician inspect it for you!

V If you are going to build, be sure to plan your wiring for the future as well as the present. Remember that on the average, your electrical needs increase 10% every

Kennecott Copper Corporation, 161 E. 42nd St., New York 17, N.Y.

Fabricating Subsidiaries: Chase Brass & Coppts Co. Kennecott Wire & Cable Co.

Published for your information by

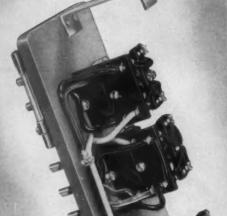
ennecott COPPER CORPORATION

This advertisement will appear, with a circulation of 15,130,000, in the Saturday Evening Post and in This Week. Other Kennecott advertisements will also feature adequate wiring to architects and builders.



No Other Alarm System Has ALL The Advantages Of

UNILARM*...



Complete details on request. Write to Dept. U-51.

*Reg. U.S. Patent Office,

DI

Special Explosion-Proof Unilarm Panel showing stock units, group mounted. Panel is factory wired, sealed and tested.





1. Provides unfailing supervision of equipment and process operations.

Precision-built to Underwriters' Laboratories requirements. Completely wired and tested . . . ready for field connections.

3. Plug-In Panel (large illustration), fits interchangeably into Explosion-Proof, Vaportight and General Purpose enclosed units. Reduces maintenance to a minimum , , easily and quickly replaced with a spare unit.

4. Your choice of 100 standard circuits to suit every conceivable application.

5. Distinctive visual signal for each condition (flashing light) insures immediate attention.

6. Any number of Unilarms may be connected to one audible signal.

 Tried and tested in the field. Thousands in use giving trouble-free protection. Accepted as standard by leading industries.

 Available as individual unit or in multiunit Panels. Also time delay types for applications subject to high surge or excessive vibration.

 Saves space, engineering costs, installation and maintenance over other alarm systems.

10. Acknowledgement-test switch permits periodic testing of each Unilarm circuit.







General Purpose Unilarm

R&S Unilarm is also available in a complete line of Surface Mounted Types — Explosion-Proof, Vaportight and General Purpose.

RUSSELL



STOLL



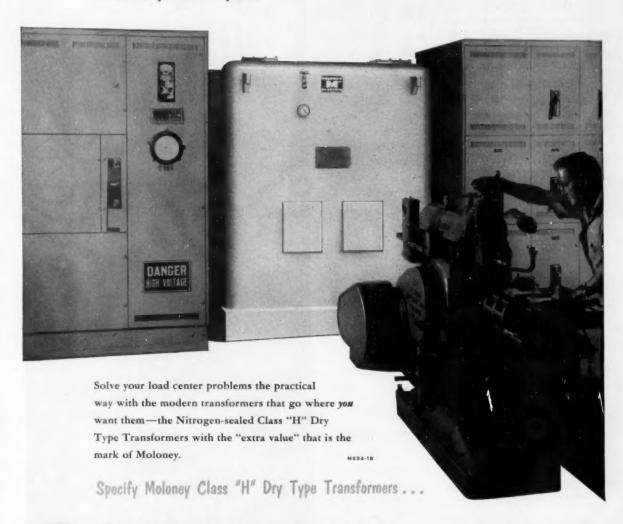
RUSSELL & STOLL COMPANY, INC. . 125 BARCLAY STREET, NEW YORK 7, N.Y.

PRECISION-BUILT ELECTRICAL EQUIPMENT-SINCE 1902

Eliminate Maintenance

Since Moloney Class "H" insulated Dry Type Transformers are nitrogen-sealed, maintenance is eliminated. They cannot produce toxic gases, never need expensive vault installations and the nitrogen atmosphere protects insulation from oxidizing. This results in longer, more dependable transformer life.

Moloney Nitrogen-sealed Class "H" insulated Dry Type Transformers offer you more protection against fire and explosion hazards. These versatile and dependable transformers can be located indoors or outdoors right next to the job and more than meet the most exacting insurance requirements. And this also means important savings in costly copper connections...less danger of accidental power interruptions.





MOLONEY ELECTRIC COMPANY

Pawer Transformers • Distribution Transformers • Step Voltage Regulators • Regulating Transformers • Load Ratio Control Transformers • Unit Substations • Network Transformers • Constant Current Transformers • Capacitors • Transformers For Electronics

SALES OFFICES IN ALL PRINCIPAL CITIES . FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . JUNE, 1954

Use this unconditional lighting fixture warranty to promote business

This seal helps you promote new lighting business... and automatically opens the door to other electrical improvements. It has merchandising power: it advertises, demonstrates, proves and helps sell your own high standards of quality.

Good lighting helps build reputation. It's an electrical improvement the public sees and talks about. It takes just one outstanding lighting improvement in a business block, and others soon follow.

That's why you don't take chances. You guarantee your work—and we have no hesitation in backing you all the way. That's why the Westinghouse lighting fixture warranty is for the exclusive use of electrical contractors who guarantee their work. You name the terms—we'll back you up.

J-04351

You can be SURE... IF It's Westinghouse



Get This Merchandising Package; Today!

Get your personal copy of the Westinghouse warranty package. Warranty covers the entire line of commercial, industrial and floodlighting fixtures (lamps, starters and labor not included).

Westinghouse Electric Corporation Lighting Division Cleveland, Ohio

Please send my personal copy of warranty package.

Company

Street

City_____State___



This low-priced Type B Time Switch

has everything you want ...

INCLUDING SANGAMO QUALITY!

STANDS ROUGH HANDLING

Sturdy, attractive, all-steel case. Hinged cover. Sealable hasp. No glass window to break. Height: 71/4", depth: 31/4", width: 41/4".

INSTALLS EASIER

Case is designed so there's wiring room in almost one-half of the inside space (see illustration). This feature, plus ½" to ¾" multiple knock-outs and a keyhole slot in the back makes for neat, fast, low-cost installation.

ANYONE CAN OPERATE IT

Setting the dial is simple. There are two "on" and two "off" levers. Trippers are easily set. Can be tripped by hand without interrupting the automatic operation.



DEAD FRONT SAFETY

A dead front insulating shield eliminates the shock hazard. No contacts or wiring are exposed.

LASTS LONGER

The type B has the famous Sangamo slow-speed motor ... the same motor used in Sangamo heavy duty switches... that stops service calls because if never stops... even in coldest winter or hottest summer.

INSTALL IT AND FORGET IT

NEMA Standard 30 ampere rating. Long-life silver consacts of "minimum are" design assure maximum performance. Carries the same liberal, 18-months guarantee as any other Sangamo time switch.

30 Amp. Rating 🕯

single pole—single throw

Only \$13.50

trade discounts apply

For years, Sangamo time switches have been the choice of the man who demands dependability in electrical equipment...the electrical contractor. He knows "Sangamo stands for quality."

Even when a low-priced time switch is called for —you want a switch that will spare you the wasted expense of call-backs due to, let's say, motor failure or jammed levers, burned contacts or stuck dials. You want performance...a switch you can install and forget. A switch that

will go on working without constant attention.

With these things in mind, Sangamo engineers designed the NEW Sangamo Type B, which offers you everything you want in a time switch, plus Sangamo Quality—quality you can trust. And all at a NEW, low price!

See this sensational value at your electrical wholesaler's NOW. Try it and when you do, you'll wipe out the service call headache and the need for defective switch replacement.



SANGAMO ELECTRIC COMPANY

ST54-2

SPRINGFIELD, ILLINOIS

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . JUNE, 1954



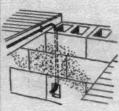
LOCATIONS



BARNS AND CORROSIVE LOCATIONS



BURIAL



INSTALLED IN PLASTER OR MASONRY BLOCK WALLS

NEW

Columbia-UF

UNDERGROUND FEEDER AND BRANCH CIRCUIT CABLE



Columbia-UF cable is a specifically designed thermoplastic cable tested and approved by Underwriters' Laboratories, Inc. and recognized by the National Electric Code (1953) for use in wet, damp or corrosive locations. It is approved for direct earth burial in branch and feeder circuits when provided with overcurrent protection. Columbia-UF is highly resistant to acids, alkalis, lubricants, corrosive fumes and water. It resists fungus and corrosion and will not support combustion.

Columbia-UF is available in sizes 14/2, 12/2, 10/2 with and without ground; 14/3, 12/3 and 10/3 without ground wire; in single conductor in sizes #14 to #4 AWG.

WRITE TODAY FOR ILLUSTRATED BOOKLET



COLUMBIA CABLE & ELECTRIC CORP.

Serving the Electrical Wholesaler Since 1912

255 Chestnut St.

Brooklyn 8, N. Y.



NON-METALLIC SHEATHED CABLE



A.B.C. ARMORED CABLE



FLEXIBLE STEEL CONDUIT UNDERGROUND FEEDER CABLE

Washington Report

The national economy's "downward drift" has been halted, claims Dr. Gabriel Hauge, President Eisenhower's economic adviser, and the "prospect for business activity in 1955 is good".

An optimistic business outlook, both short and long term, is bolstered by many economic indicators. Industrial production held steady in April and May, FRB reported. Consumer durable sales show new strength—due in part to continued high auto output. Unemployment dipped 260,000 in April, from March level of 3,725,000. Total labor force of 64.1-million is reported by Census Bureau, leaving 60.6-million gainfully employed (end of April). Construction expenditures remain up—totaled \$2.8-billion in April for new record for that month. These and other economic factors reflect economic stability based on civilian demand.

Possibility of war is not discounted by Washington officials, who feel Southeast Asia must be protected from Communist domination. Intervention would up military needs, boost defense spending. This, combined with a rising civilian economy, would increase possibility of inflation. In making advance plans business should not lose sight of this possibility.

A new housing bill which plugs loopholes of the former National Housing Act of 1949 and sets up stricter rules on mortgage guarantees is expected to be passed by Congress shortly. Tightening of rules would prevent profiteering on mortgages insured by FHA as revealed by the recent FHA investigations. In other respects the bill may be more liberal. Probable terms: smaller down payments, 30 year terms, increased limit of Government-insured mortgages to \$18,000, \$24,000, and \$30,000 on one-and-two family, three family, and four family homes respectively, with 95% guarantee of first \$9,000 and 75% of the rest. The bill may also carry Presidential authority to build 35,000 or more public housing units annually.

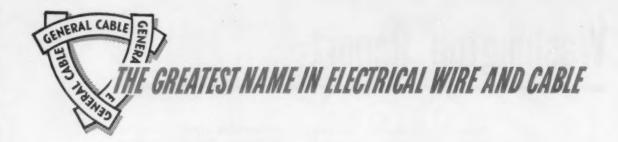
New Director of Electrical Equipment Division, BDSA. is Clark M. Wright of Schenectady, N. Y., appointed to replace Bonnell W. Clark who resigned last December. (See page 203)

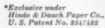
Home construction in 1954 may reach second highest total on record, Federal housing experts predict. Housing starts in April were 110,000, highest monthly total for $3\frac{1}{2}$ years, or at yearly rate of more than 1.1-million starts. In 1950, a record year, 1,352,000 private housing units were started. The nation's homebuilders are equally as optimistic as the Federal experts—on the proviso that Congress pass the proposed Administration housing bill with relaxed terms on FHA-insured mortgages more favorable to middle income and non-veteran home prospects.

Public housing, down to 900 starts in April, is expected to get a boost in the new housing bill. PHA officials fear a slum level of living for many, even with easier loans for low-income families. These same officials report increases in operating and maintenance costs for public housing units built 10 years ago.

New building construction continues its upward climb. Dept. of Labor and Commerce reported April expenditures at \$2.8-billion, 9% above March, 1% ahead of a year earlier.

A \$305-million public works bill for a 10-year Government building program in the District of Columbia has been signed into law by President Eisenhower. The money will be spent on schools, hospitals, highways and water facilities, it is reported.







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JUNE at a Glance

LIFT SLAB—A new and spectacular building method casts complete floor slabs at ground level and elevates the finished slab into position. A pace setting project for RCA incorporates a quarter million square feet of this new kind of building.

The characteristics of lift slab work, however, present many new and unusual problems for the electrical contractor. Locating and securing conduit and outlets prior to the pour is totally different from work in conventional concrete slab construction.

Industrial Editor Hugh P. Scott with the cooperation of the architects and the electrical contractor, Fischbach and Moore of New York, brings us an onthe-job study of this project which is expected to be a prototype for many other lift slab jobs as the techniques become more widely accepted by the electrical and construction industry. "Lift Slab Wiring Techniques" begins on page 75.

INDUCTIVE FLUORESCENT LOADS—While Code requirements for calculating loads on fluorescent lighting systems are quite definite, traditional practices of calculating lighting loads interms of units still bring in many questions about the correct approach. B. A. McDonald, of our panel of Code authorities, tackles two aspects of fluorescent lighting in his

"Common Code Problems" (page 74) this month. He takes up the two common questions pertaining to load calculation and switch rating and develops the correct methods around a simple example.

UNUSUAL JOB-Tough electrical problems may or may not have a direct influence on the national aspirin consumption but, once those problems have been solved successfully, a contractor can take jusifiable pride in a job well done. That's the story right now in Cleveland, where Hatfield Electric tackled a real "toughie" for SOHIO-Stand Oil of Ohio-and won local kudos by an exceptional job of converting a multi-story garage into one of the most modern offices in town. You'll find the account-together with a hat-full of practical installation ideas-on page 80.

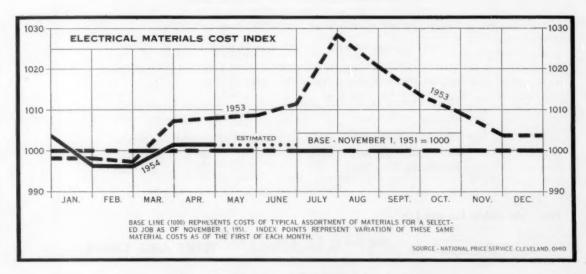
HOSPITAL WIRING—Highlights of electrical distribution and circuit wiring in the ultra-modern Kaiser Memorial Hospital, San Francisco, Calif., are presented by Earl W. Peak, Central Electric Co., starting on page 87. This hospital is one of a number built by the Kaiser Foundation to provide the best of medical and hospital services for the general public, members of the organization's voluntary Health Plan and employees of Kaiser Indus-

tries. Electrical layout, designed to provide the ultimate in comfort, convenience and safety, is functional and of high capacity. Much of the wiring in the Kaiser-Memorial building represents significant innovations in hospital electrification.

COMING UP—Our next issue, July, will bring you a special editorial report on electrical modernization. For many months our editors have been traveling over the country gathering case reports of electrical modernization work; the problems, the methods employed and the results. The published proceeds of their efforts will bring together a wide range and variety of studies; the practical facts and current practices of this vast market as they appear in specific industrial, commercial and residential jobs.

There are substantial trends indicating a growing market for the goods and services of this industry to bring electrical systems in existing buildings up to modern standards of effective and efficient electrical utilization. The need for such work is obvious. But the practical problems of initiating and carrying out modernization projects are very real.

Reports based on actual current experience, therefore, is "must" reading for everyone interested in developing this vital business opportunity.



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Emergency Power Is Essential

Stand-by electric power is becoming a highly essential service. It is time that electrical engineers and contractors begin to understand the new and unusual responsibilities for power continuity that the times and the trends have thrust upon them. Beyond elementary panic prevention and property protection in momentary emergencies the stand-by plant looms even more importantly as an essential and prudent insurance.

Our community life has moved outward from the cities. Following phenomenal suburban housing growth, commercial, institutional and industrial areas have been created in outlying areas. These are served by long, open distribution lines vulnerable to storms, accidents or sabotage. And to these outlying communities we have carried our city-bred confidence in uninterrupted service with the result that we have achieved nearly total dependence on a supply of electric energy.

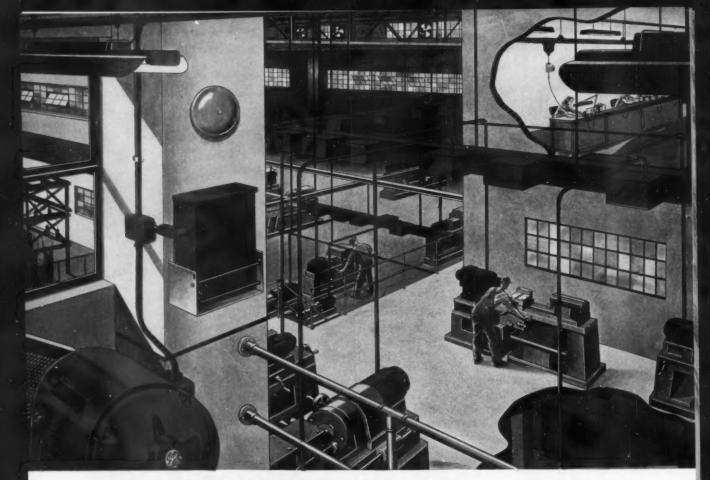
In places of public assembly our building regulations usually require emergency lighting capable of operating immediately in the event of power interruption to permit safe and orderly evacuation of the premises. But in a suburban business community or a crossroads shopping center evacuation of the premises is an unnecessary, expensive and totally undesirable response to power failure.

Excellent and reliable stand-by power equipment is available at an installed cost well within the range of prudent insurance. It deserves a new look, not only for the emergency prevention of panic and theft, but to avoid the commercial losses that could result from even temporarily useless premises. Capacity to maintain near-normal heat, light and refrigeration is entirely practical. And in the event of enemy attack or disaster the value of such dispersed, self-contained and fully operative community resources would be beyond calculation.

Statistics of utility service continuity are inadequate criteria for judging the need for stand-by power. It is precisely in those areas with long and excellent records of service that we are most likely to find premises wholly dependent upon electric energy and without alternative facilities. Many home owners in suburban areas have installed small emergency power plants to serve essential refrigeration, heating and lighting loads. They have done so out of their own experience with power failures in electrically dependent homes with little, if any, systematic encouragement from the electrical industry.

It seems about time that electrical men with experience and knowledge of the needs took a more active and persuasive part in initiating stand-by power installations. If we are to encourage all-electric dependence, we have an elementary responsibility to provide against any probable power outage. For our new outlying commercial centers the immediate and essential values should be obvious.

Um. T. Stuart



RADIAL LOAD CENTERS, TRANSFORMERS, CAPACITORS, AND BUS DUCT SYSTEMS contribute heavily toward lowered production costs for your industrial clients - a fact that grows in its importance to them each day. To help you plan efficient power distribution systems for them, feel free to call on the services of a Graybar Representative at any time.

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"Equipment for Industrial Plant Power Systems" . . . This factfilled bulletin lists data on a wide variety of power distribution equipment including:

substations, switchgear, feeder breakers, voltage regulators, lightning arresters, and busways.

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- up to 34% more capacity from existing systems
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- up to 50% savings on power costs
- up to 150% annual return on your investment

Powerful statements, to be sure, but still facts that can be backed up with actual case-history proof by your local Graybar Representative.

If your customers face the problem of designing a new power distribution system - or of forestalling major rewiring through increased efficiency of an existing system - now is the time to call Graybar.

You know that it's just as costly to plan for, install and service inferior. misfit equipment as it is to do the same with quality items custom-fitted to specific needs. Let Graybar Power Specialists help you prove it. .

As distributor of over 100,000 different electrical items made by 300 leading manufacturers, you can always be sure of carefully-considered. impartial recommendations. It's the common-sense result of ordering power needs - as well as equipment for lighting, wiring, ventilating, and communication - via a single source . . . a single responsibility.

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Class II, Group G Hazardous Location



Wiring a Grain Elevator

Looking over installation methods and details used on the extensive hazardous location electrical system in the recently completed New Orleans Public Grain Elevators.

By Harry Nienaber,

Manager, Victory Electric Works, New Orleans, La.

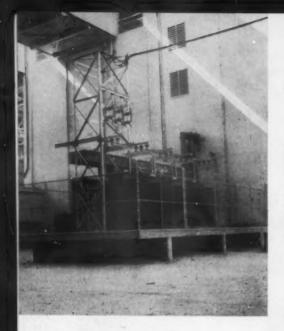
MODERN electrical system—including extensive circuitry for and application of motors, lighting, controls and signals—today vitalizes operation of the new Public Grain Elevators, New Orleans, La.

Located on the Mississippi River, the plant consists of several interconnected parts. First, there is the main building which consists of the operations section and the silo storage section. The operations section is the high, front part of the building in which electric rooms, riser shaft, conveyor interconnections and offices are located. The silo storage section consists of a square grouping of 81 silos (nine rows long and wide). Enclosed ramps house conveyor belt runs extending out to handling and ship-loading equipment in buildings along the dock.

Electric energy for the overall plant is supplied to an outdoor substation alongside the operations part of the main building. From this sub, busway feeds six distribution center electric rooms on different levels of the operations part of the building. Because grain is handled and stored at this plant, the electrical installation is made in accordance with N E Code (Article 500) regulations for Class II, Group G, Division 1 hazardous locations.

In addition to the elements of the electrical system in the main building, shown on the following pages, extensive circuits and equipment for power, light, control and signals were installed in the smaller buildings at dockside. Because these buildings also come under the "hazardous location" classification, the details of electrical work are similar to those in the main building.

Electrical construction was done by Fischbach & Moore, Inc.; Victory Electric Works, New Orleans. Fegles Construction Co., Inc., Minneapolis, Minn. was general contractor; Jones-Hettelsater Co., Kansas City, Mo. was responsible for the engineering.



OUTDOOR SUBSTATION, alongside main building, supplies 440-volt, 3-phase power over busway to electrical rooms in grain elevator. A 13.8-kv aerial line—three #1/0 conductors with metallic shielding and built-in supporting messenger cable—comes into three single-conductor potheads on substation tower. Potheads are capnut or "petticoat" type 15-kv insulators, with packing gland type entrance for cable. Autovalve type lighting arresters, power fuses and pole top switch protect this aerial line at the terminal pole from which the line runs to the substation. The sub is 3750 kva, 13.2 kv/440 volts, 3-phase 60 cycles—consisting of 3 single phase 1250-kva transformers delta-delta connected and one spare transformer of the same size. Disconnect switches are SPST 400 amp, 15 kv. Primary bus wiring is #1/0 solid bare copper wire. Transformer secondary 6000-amp busway ties into main 6000-amp, 600-volt, 3-pole CB in cubicle on platform. Power is then distributed at 440 volts, 3 phase through 4 1600-amp feeder CB's in the cubicle to four 3-conductor busway runs which enter the building through the wall. All steelwork, busways, cubicles, transformers, fence, etc., is grounded to a station ground bus connected to a water main under the platform.



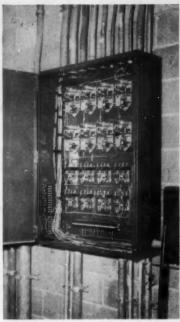
OVERHEAD BUSWAY, four direct runs—two above two—from outdoor sub, comes into first floor electric room through wall (at rear in photo). Three 600-amp fused safety switches are mounted on underside of each of two bottom busway runs. These switches tap power from busway to two motor control centers, a lighting transformer and a 400-amp, double-throw, 3-pole safety switch feeding power to electrical operations at dockside. Busway runs are supported by sections of channel iron suspended on rods anchored in concrete ceiling slab. The two bottom runs of busway are terminated in this electric room by ground detector and potential neutralizing plugs. This room, other electric rooms in the building and pipe shaft for busway and conduit risers are maintained under positive-pressure ventilation. These areas are considered non-hazardous locations; all other areas are Class II, Group G, Division I hazardous locations. The lighting fixtures, however, are dust-tight units, with fixture fitting supported by busway.



CONTROL CENTER is one of two power distribution cubicles in first floor electric room. Two runs of conduit coming into top of enclosure (at upper left in photo) are feeds from overhead busway. Cubicle houses line starters for fan, belt and pump motors, float switch controls and circuit breakers for sub feeders and electric heaters. Seven wall-mounted 3-phase capacitors, 5- and 10-kva units, for power factor correction (shown at right) tie into seven starters for motor loads from 10 to 30 hp. Each capacitor is connected to motor terminals on starter for motor which capacitor serves. Capacitors are mounted on brackets which are fastened to wall. All large size motors (10 hp and up) throughout building have individual capacitors for power factor correction. A 15-amp, 2-pole, 3-wire wall receptacle, for Class II Group G, is shown at extreme right.



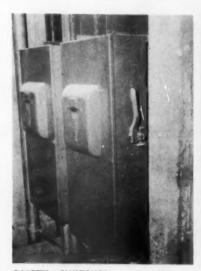
LIGHTING TRANSFORMER in first floor electric room is dry type 1121/2-kva, 3phase, 480-volt primary to 120/208-volt 4-wire secondary, Class B insulation. It is fed through 200-amp, 3-pole, double throw safety switch (shown on wall) from either of two busway runs which supply the equipment in the room. One 600-amp safety switch, fused at 150 amps, feeds the 200-amp switch from each of the two bus runs. Supply to the transformer may be made from either bus. This transformer feeds a lighting distribution panel—3-phase, 4-wire, solid neutral, 120/208-volt, with 400-amp mains. Through 3-phase CB's—4 70amp and 1 50-amp-eight local lighting panels on five floors are fed from the distribution panel. The transformer is mounted on angle iron sections which are secured to the floor.



TERMINAL CABINET for interlocking and signal circuits is wall-mounted along-side relay box in first floor electric room. Belt conveyors and dust collecting fans have their motor controllers interlocked to prevent choke-up in grain flow. Signals and indicators are used throughout the building to inform control stations of conveyor belt movements.



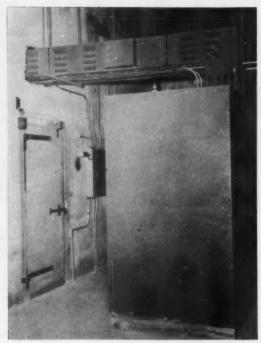
RISER SHAFT (looking up from bottom) adjoins electric rooms on first floor, bin-loading floor and top floor. It is centrally located in main structure at dockside end of building. Busway, 2 runs from outdoor sub, comes through wall from first floor electric room and is supported by angle iron brace. Pipe and angle braces are used to support the vertical bus. Multiple pipe clamps—angle and straps—support conduit risers. This shaft is pressure ventilated and non-hazardous as are electric rooms. Opening through wall has yet to be closed up around bus and conduit.



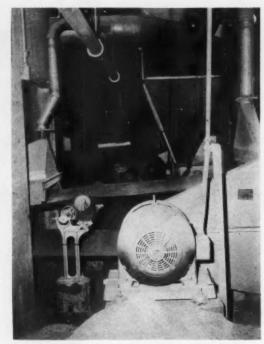
SAFETY SWITCHES, each 600-amp fused, tap power from two busway risers in shaft adjacent to electric room on belt loading (5th) floor. Angle iron is used to mount switches on bus risers.



CLAMP RACK is shown here for conduit risers in riser shaft alongside busway. Individual clamp straps on conduit are held by lips on channel section which is bolted to a similar section of channel recessed in the concrete wall of the shaft. Part of the vertical angle iron which supports the busway can be seen bolted to the wall on the right side of the busway.



END OF LINE for two busway risers is electric room on the garner (next to top) floor of building. Hole in wall through which busway passes from riser shaft to two motor control centers (shown) had not yet been filled in around busway when picture was taken. A ground detector and potential neutralizing unit (arrow) is mounted on each of the busways at this location. Door to riser shaft and lighting panel are shown at left.



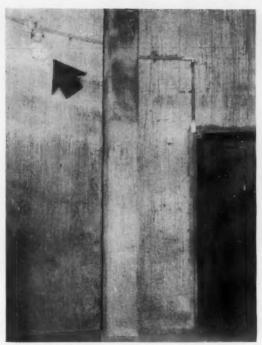
MOTOR FEED to dust-tight 25-hp conveyor-belt drive in headhouse basement consists of rigid conduit down to clamp on upright post where it connects to greenfield feeding box on motor. Motor itself is mounted on raised concrete base. A second such motor is seen in the background; there are eight such motor applications in all. Belt entering opening at left runs the depth of the storage area, through nine silos.



SIGNAL STATION on upper floor in headhouse consists of pushbutton boxes, dust-tight receptacles and plugs, and signal horn. Equipment is neatly mounted on a barstock rack which in turn is firmly anchored to concrete-block wall by short sections of pipe standoffs.



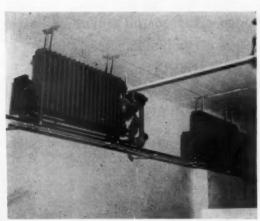
BASEMENT FLOOR includes bottom level of 81 silos and conveyor-belt equipment area at end of basement beneath headhouse (the high part of the building adjoining silo storage section). NEMA 9 enclosure at right houses 3-phase, 4-wire lighting panel with 20-amp branch circuits balanced on phases and fed from first floor transformer. This dust tight panel is mounted on vertical sections of metal framing which are bolted to concrete wall. At left, an ammeter in a dust-tight enclosure and a remote control start-stop pushbutton station are mounted on the wall. These ammeters, with 5-amp scales, are wired to 400/5-amp current transformers installed in 250-hp starter cubicles in garner floor electric room; they indicate load on the motors. Start-stop station shown controls nearby 25-hp motor driving conveyor belt. There are seven other ammeter and pushbutton stations along basement wall.



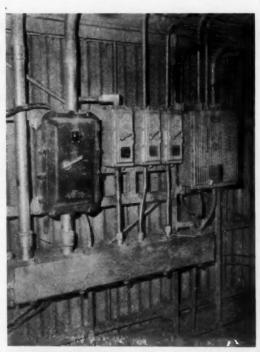
LIGHTING UNITS in silos are 200-watt, incandescent, bracket-type, dust-tight fixtures (2 in each silo, diametrically mounted 8 ft.-6 inches above the basement floor). Units are hung from Class 2-G outlet boxes on continuous conduit runs clamped to concrete surface and mounted as shown. The circuit is carried from a nearby dust-tight lighting panel down through a row of nine silos. Similar lighting circuits are used in other silos.



SIGNAL LIGHTS for interlocking control of handling equipment are dust-tight units, mounted on underside of door lintel at basement entrance to a silo. Arrangement of chutes for feeding grain to conveyor belts can be seen in the background. Six of the nine rows of silos have conveyor belts passing through them, with chute arrangements in each silo to feed the belts. Interlocking controls prevent accidental mixing of grains.



ELECTRIC HEATERS, shown here in first floor lavatory, are 3-phase, 440-volt, 5-kw, thermostatically controlled water-filled radiator type units. This type of unit, used for heating offices and locker rooms throughout the building, is listed for Class 2-G locations. Protection against overheating and operation without water is provided in the unit. Each heater is supplied through a 3pole magnetic contactor actuated by its operating coil which is in a 115-volt, mercury-switched thermostat circuit. As shown, units are suspended by rods imbedded in the ceiling, with the back legs of the heaters resting on a run of channel iron supported by rods in the walls. Branch conduit feeding units runs alongside channel iron. The 440-volt supply circuit for the heaters shown here originates in the control center in the first floor electric room and is protected by a 20-amp CB. Other heating circuits are identical to this.



SWITCH ENCLOSURES and conduit are racked on bar stock structure fabricated on corrugated metal wall of one of covered conveyor ramps which extend from main building to waterside dock. This equipment supplies lighting and motors at one end of dock.



NEW OFFICE BUILDING for Hoffman & Jacobs, Inc., adjoining residential section in Long Beach, Cal., is modern brick and concrete block structure. Windows are of the modern vision strip type, with vertical louvers.



RECEPTION LOBBY presents cheerful entry to building, with luminous ceiling and grained wood walls and counters.

Contractor Super-Lights own Building, Uses . . .

Overall Ceiling of Light

Electrical contractors Hoffman & Jacobs, Inc., install Wakefield luminous ceilings throughout their new office building, use light finished desk tops for better vision, and vertical louvered vision strip windows for sunlight control.

By Berlon C. Cooper

Electrical contractors across the nation are becoming more lighting conscious. This is most readily apparent from the large number of good lighting installations being installed by electrical contractors in their own premises over the past several months. These include modern lighting systems of several types—troffers, continuous row suspended louver type units, recessed louvered silvered-bowl units, luminous ceilings, etc. Often these systems are combined, so that they may be used to demonstrate lighting results from each type lighting system to prospective customers.

Use of luminous ceilings by Hoffman & Jacobs, Inc., to light their entire new office building, as described in the ac-

companying article, is typical. While this outstanding lighting installation will be used to help promote such lighting with their customers, major significance is that Hoffman & Jacobs officials selected and installed this type of lighting for its inherent benefits in producing a desirable visual environment.

Editor

HEN Hoffman & Jacobs, Inc., electrical contractors in Long Beach, California, decided to build a modern new office building last year, they also decided it should be well lighted. They decided the lighting system should be as modern as the building and furnishings, and representative of today's best lighting practices.

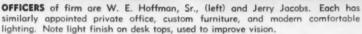
To insure a good lighting system, certain requirements were listed which should be met. The system should provide a high intensity of illumination, adequate for the many difficult seeing tasks which would prevail in their offices-drafting, estimating, reading blueprints, typing, accounting, filing, and similar office work. The lighting system should be modern in appearance, and conform in appearance with modern office furniture, desks, business machines, etc. It should provide comfortable lighting of uniform intensity throughout. And the lighting should be glareless, and shadow-free.

The building itself is one story high, and is 75 feet long by 30 feet deep. It contains a reception lobby, general office, estimating and drafting room, four private offices, and a utility room.

After considering several types of









ESTIMATOR is W. E. Hoffman, Jr., who works in light- and sound-conditioned area. Vision strip window faces north.

lighting systems, it was decided that a wall-to-wall type of luminous ceiling installation would successfully meet all the requirements which had been established. Wakefield's corrugated Plexiglas luminous ceiling system was selected and installed throughout the entire building, except for the utility and storage room, in which conventional incandescent lighting is used.

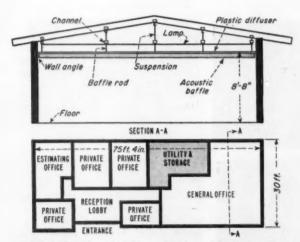
By using the Wakefield luminous ceiling, it was possible to eliminate the cost of the usual acoustical suspended ceiling, partially offsetting the cost of the lighting system. Acoustical treatment was applied in the general office and estimating office by installing Wakefield acoustic baffles, suspended from baffle rails which also serve as supports for the corrugated plastic diffuser panels.

The Plexiglas ceiling is supported 8 feet-8 inches from the floor by baffle rods to a wireway channel framework, which in turn is supported by suspension rods hung from the roof trusses. The channel framework carries all wiring, ballasts, lampholders, etc. to support standard slimline lamps, on spacings of 36 inches on centers. At wall lines lamps are on 18-inch centers.

A total of 1965 square feet of area is lighted with this ceiling, with a total load of 10,375 watts or 5.3 watts per square foot. There are 46-96T12 lamps, 45-72T12 lamps, and 24-48T12

lamps in the plenum above the corrugated plastic ceiling. The entire plenum was painted flat white to provide maximum lighting efficiency and complete diffusion of light through the plastic panels.

Initial lighting intensities on this installation ranged from approximately 90 footcandles in the small private offices to 135 footcandles in the large general office. Design levels, maintained, were for 55 footcandles and 70-75 footcandles, respectively, for these same areas. Experience over the first seven months indicates that in-service design levels will be more than maintained, as depreciation has been very low.

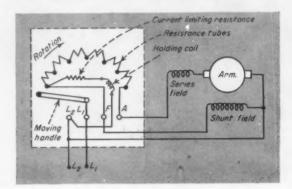


CROSS-SECTION at A-A shows location of luminous ceiling with respect to roof (top), while ceiling plan shows office layout and area lighted by luminous ceiling. Wall-to-wall lighting is used throughout the one-story building except for utility space.



GENERAL OFFICE is light and sound conditioned, has manually-operated vertical louvers over narrow vision strip windows to shield direct rays of sun. All desks have light finished tops for minimum brightness contrasts.

AT THE TEST BENCH-2



The Four Point Starter

By Walter J. Prise

Chief Engineer
The Maintenance Co., Inc.
New York, N. Y.

AS SHOWN in the above diagram, the "four point starter" for shunt and compound wound dc motors is somewhat similar to the "three point starter" (last month's installment of AT THE TEST BENCH). The difference between the two starters is in the hookup of the holding coil and shunt field. As a result of the hookup used in the four point starter, the face plate of the unit has four terminal posts for connection of the complete motor circuit. As with the three point starter, the number of terminal posts gives this starter its name. The four terminals should be identified by letters as follows: "L₁" for line one to the moving handle, "L₂" for line two, "F" for field and "A" for armature.

Operation of the four point starter begins with movement of the spring-loaded handle to the right to the first resistance contact. At that point, three current paths are closed between "La" and "La". The armature and series field are energized in series with all of the starting resistance; the holding coil is energized in series with a current limiting resistance; and the shunt field is placed directly across the line. By gradual movement of the

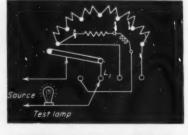
handle to the right, resistance is cut out of the armature circuit and into the holding coil and shunt field circuits. In the final position, all the way over to the right, the handle is held by the magnetic holding coil. In that position, all of the starting resistance is out of the armature circuit and in series with the parallel combination of holding coil and shunt field.

This starter provides "no voltage" protection; i.e., if the line voltage should fail while the handle is in the final position, the coil will be de-energized and the handle will fly back to the left. As a result, a sudden return of power to the line will not find the handle in the final position and the armature across the line with all of the starting resistance cut out. This protects the motor from burning up due to starting current.

As shown, a current limiting resistance tube is used in series with the holding coil. This hookup makes possible the use of a much smaller and inexpensive coil.

Following is a series of tests made on a typical four point starter. The tests provide a ready identification of the four terminal posts on the face plate of the unit.

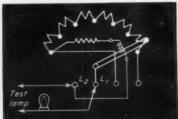




STEP 1.

Locating line terminal "I," with a test lamp. Put one test probe on an uninsulated part of the handle; move the other probe from button to button until lamp lights. Mark this terminal "L,".



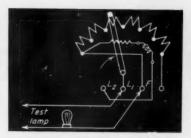


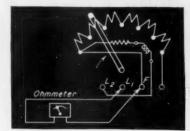
STEP 2.

Locating line terminal " L_1 ". Put one test probe on terminal " L_1 "; move handle to final position; then touch other probe to the other three terminals to find the one which completes the holding coil circuit and holds the handle firmly in the final position. This terminal is the other line post. Mark it " L_1 ".







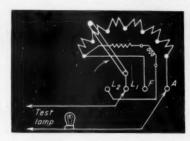


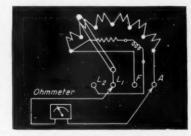
STEP 3.

Locating the field terminal. This test can be made with either a test lamp (top) or an ohmmeter (bottom). Using a test lamp, put one probe on "L₁"; touch the other probe to each of the still unidentified terminals. When the probe is in touch with the field terminal, "F", the lamp will glow brightly but will decrease in brightness as the handle is moved from left to right. Making the same check with an ohmmeter, with one probe on "L₁" the resistance reading will increase when the other probe is on "F" and the handle moved from left to right.







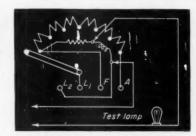


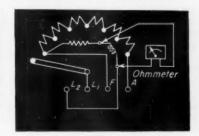
STEP 4.

Locating the armature terminal. For testing with a test lamp, put one probe on "L₁"; touch the other probe to the remaining unidentified terminal (top). As the handle is moved from left to right, the brightness of the lamp should increase to its full-voltage level. If it does, mark this terminal "A". Using an ohmmeter with one probe on "L₁" and the other probe on the unidentified terminal, the resistance reading should decrease if the unidentified terminal is "A" (bottom).









STEP 5.

Testing for open in holding coil. Using a test lamp, put the probes directly across the coil terminals on the face plate of the starter (top). If the lamp lights, there is no open in the coil. In the case of an ohmmeter with its probes across the coil terminals, a low resistance reading indicates that the coil has a continuous current path and is not open (bottom).

Common Code Problems

Load calculation for inductive fluorescent ighting systems

By B. A. McDonald*

LUORESCENT lighting installations present an inductive load to the wiring system. Code provisions relating to inductive loads must be considered, therefore, in calculating current, wire sizes and switching. These provisions are the subject of many questions because industry practices have grown up around the resistive loads of incandescent lamps.

A common practice in calculating lighting loads sums up lamp watts to find total watts. The sum is then divided by the line voltage to find current. Since there are losses in the ballasts, it is apparent that the total lamp watts on fluorescent lighting installations are less than the actual load. Adding ballast watts loss will provide some correction. With high quality, high power factor ballasts, the resulting error will be small; but it can still be significant on large or closely figured installations.

The Code is entirely clear on this point, but the provision is often over-looked. Section 2125-b says, "In computing the load of lighting units which employ ballasts, transformers or autotransformers, the load shall be based on the total of the ampere ratings of such units and not on the wattage of the lamps."

To demonstrate, let us take a simple fluorescent lighting circuit and figure it for current. The voltage is 120. There are 14 fixtures, each 2-40 watt with .85 amp, two-lamp ballasts.

DIAGRAM of author's example illustrating Code method for calculating fluorescent lighting loads and determining required switch ratings.

Fluorescent lamps only (incorrect) 28 40-watt lamps

 $28 \times 40 = 1120 \text{ watts}$ 1120/120v = 9.3 amps

Lamps plus ballasts (incorrect)

28 40-watt lamps, 14 18.5-watt ballasts (approximate ballast watt loss)

28 × 40 = 1120 watts

 $14 \times 18.5 = 259 \text{ watts}$

Total = 1379 watts

1379/120v = 11.4 amps

Code method (correct) 14 fixtures at .85 amps each

 $14 \times .85 = 11.9 \text{ amps}$

It will be noted that the correct Code method is also the easiest to use. The ampere rating of the ballast takes care of the lamp watts, losses and the power factor of the inductive load.

Switching

The inductive character of fluorescent lighting loads affects the choice and rating of switches. The Code is also quite specific on this. Section 3814-c covers the requirements for

switching inductive loads with snap switches. It states, "Switches controlling inductive loads shall have an ampere rating twice the ampere rating of the load unless they are of a type approved as part of the assembly or for the purpose employed."

In the example cited above the load is 11.9 amperes. Twice this, to comply with the rule, is 23.8 amperes, which would require a switch rated at 30 amperes (the next commercial size).

The provision, however, applies to snap switches. Panelboard circuit breakers are designed to break abnormal currents and, in my opinion, would come under the "for the purpose employed" exception in the rule cited. Thus, in our example, a 15- or 20-ampere circuit breaker would be acceptable for this curcuit and could be used for switching.

Summing up, wiring for fluorescent lighting loads should be calculated on the ballasts' current ratings, and switches must be rated for twice the current of the controlled load unless specifically rated for inductive loads.

^{*} Consulting Editor, Electrical Construction and Maintenance; President, International Association of Electrical Inspectors; formerly Chief Electrical Inspector, New York Board of Fire Underwriters, Rochester, N. Y.



FROM ALL PARTS OF THE COUNTRY, contractors and engineers journeyed to witness the lifting of the first roof slab of the RCA project. As the slab rose slowly into the air, theory and lifting procedures were explained to those assembled.

Lift-Slab Wiring Techniques

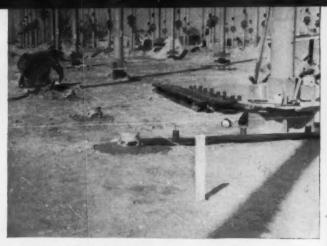
Pace-setting RCA project incorporates a quarter-million square feet of "lift-slab construction"— a revolutionary method of building that reduces overall costs, saves time and materials, and improves safety. Yet it also creates new problems for the electrical contractor, simultaneously enhancing his importance and extending his scope. Solutions to these new problems, adopted by Fischbach and Moore, are herein presented for critical analysis.

APIDLY nearing completion near Camden, New Jersey, is a modern 5-building engineering-researchsales center. This outstanding structural quintet-designed for the Radio Corporation of America by architect Vincent G. King and incorporating a top-flight electrical installation by Fischbach and Moore-has the interest of the entire electrical industry. Surprisingly, however, this interest is focussed not on the distribution system as such, but upon methods devised or adopted to solve unique installation problems related to a revolutionary new type of general construction.

This new building technique is known as the "lift-slab method of construction" and it is still novel enough to rate headlines. In fact, the RCA project is only the seventh one of this type to be erected in the country, and the method has yet to be practiced outside the United States. The future for this new building approach, however, seems bright, because overall



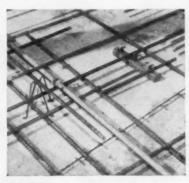
FOREST OF STEEL COLUMNS, with collars around their bases and painted bands indicating elevation of upper floors, rises from leveled and tamped datum plane, upon which the ground slab will be placed. Deep concrete pedestals and steel base plates provide firm column foundations.



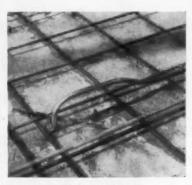
JUNCTIONS ARE PLACED ON LINE, leveled for elevation and grouted in place before connecting sections of underfloor duct system are installed. Home runs to panel locations are also installed prior to pouring. All boxes, duct outlets and conduits are capped to exclude debris.



SPRAYING OF CURED SLAB with waxbase compound prevents adherence of second floor slab which will be placed directly on top. Techkote lift-slab compound was delivered in 53-gallon drums.



DIRECTLY ON TOP of first slab goes reinforcing steel and hangers to be embedded in the second. Hangers consist of end-closed Unistrut sections. Note use of bar bolsters and high chairs.



SLAB-CONTAINED CONDUIT is bent first up, then down, to lessen severity of turn. Coupling for vertical drop, now resting directly on waxed first-floor slab, is secured by spot-welded bracing bars.

construction periods can be shortened by as much as 20%, labor and materials are conserved, safety of construction crews is enhanced, and total building costs are gratifyingly lowered—even though the electrical component may run from 5 to 15% higher than a comparable installation in a conventionally built structure.

For three reasons, therefore, alert electrical men are studying this unusual construction method. First, because engineering and economic advantages definitely promise nationwide acceptance. Second, because electrical work associated with lift-slab buildings offers a challenge to them for pioneering. And third, because those who contemplate designing, bidding on, or installing these electrical systems should be fully cognizant of related problems.

Briefly stated, the construction of a lift-slab building begins with the erection of heavy tubular steel structural columns, and the pouring of a reinforced concrete base slab directly on a leveled and tamped ground datum plane. When cured, this slab is sprayed thoroughly with a liquid wax-base compound. Then special cast-steel collars are placed around each column, reinforcing steel and all utility components to be contained in the second floor are positioned, and concrete for the second slab is poured directly on top of the first, the wax coating preventing sticking of the two slabs. This procedure is repeated until all floors, plus the roof, have been formed. At this point, the job appears as a stack of concrete layers, one directly on top of another although still at ground level, with columns protruding upwards to the full designed height of the building. And, because of this appearance, those on the job have nick-named the construction method "pancake makeup"

Hydraulic jacks are now placed atop

all columns, bracketed by threaded steel rods extending downwards to engage lugs of steel collars incorporated in the roof slab. These jacks are remotely controlled from 12-unit consoles so as to operate concertedly, each at a pressure of 1½ tons, thereby lifting the entire roof slab to its designed position. Collars and plates are then welded to columns at precise elevations, jack rods are lowered to engage collars of the top-floor slab, and this lifting routine is repeated until all floor slabs are permanently secured.

To complete the job, penthouses are added for substations, elevator motors and controllers, air conditioning and ventilating equipment; vertical electrical risers and all other utility components are installed to establish floor-to-floor continuity; suspended equipment is hung from slab-embedded pre-set hangers and, finally, exterior brick walls and pre-fabricated side panels enclose the basic structure.



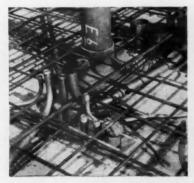
DOUBLE DUCT UNDERFLOOR SYSTEM is covered with mesh of reinforcing steel before ground slab is poured. Use of building paper beneath mat retards drainage of moisture from slab. Junction boxes and floor outlet collars are of extra depth, permitting coverage of ducts by thicker concrete layer.



FORMS AND SCAFFOLDS ARE ABSENT, except around slab edges, thereby saving materials and considerable construction time. Collars around columns, to be later incorporated in slabs of upper floors, have been raised and blocked out of the way temporarily.



FLOOR SLEEVES, formed from galvanized sheet steel, are packed with burlap or crumpled newspaper to exclude concrete during pouring stage. Conduits are wired or welded at frequent intervals.



LOCATION OF PANELBOARD is indicated by framed riser shaft. Note collar around column, with lug openings by which threaded rods descending from hydraulic jack will be secured.



ALUMINUM JUNCTION BOX, cover removed, shows access to all wireways. Note use of mastic for sealing all connections, also reinforcing steel above and below ducts to improve slab strength.

From this over-simplified discussion it is apparent that scaffolding is unnecessary and, except for outside edges of slabs, all framework can be dispensed with. All materials can be installed at ground level, elevators and hoists are not required, transportation and placement times are greatly shortened for all trades, and workers are protected from the possible danger of falling or being struck by dropped objects. And, in addition, since upper and lower couplings for risers are installed in close proximity to each other, perfect vertical alignment of these elements is possible.

These enumerated advantages can be translated into terms of economy, efficiency, safety, speed and job simplification. Yet, due to this very simplification, electrical installation problems are increased.

For example, since all formwork is absent, electrical components cannot be nailed to wooden frames but, instead, must be welded securely to the the reinforcing steel to insure rigidity and exact alignment of parts when concrete is poured. This single item is critically important, for welding is far more extensive than normally anticipated. In fact, many components can be properly positioned and secured only through the use of multiple bracing and as many as six or seven separate welds, a fact which necessitated the full-time use of from 4 to 6 welding machines on the RCA project.

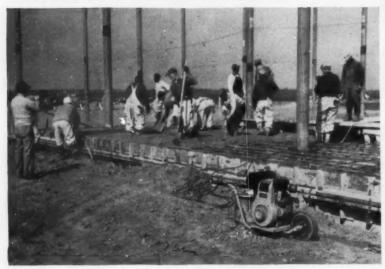
Several of these welding problems involved the positioning of conduits bent and coupled in the vertical plane, ceiling hangers consisting of short lengths of end-closed Unistrut channels, slab sleeves for risers formed from sheet steel, conduit stubs entering riser shafts, underfloor ducts and junction boxes, plus saddles and stirrups for related equipment contained within the various slabs.

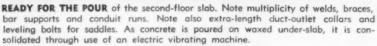
From this analysis of lift-slab con-

struction, it is also apparent that the electrical installation must be a carefully pre-engineered double-checked precision job because, once slabs are poured, there are no opportunities for correcting errors, shifting misplaced conduits or outlets, or installing overlooked hangers and recessed lighting units. The time for addition or subtraction has then passed, and the merit of the electrical installation must stand or fall on the extent of the contractor's experience, planning and supervision.

On this RCA project, 3-phase 3-wire primary utility service at 4160 volts is carried underground via 4-inch Transite ducts to the utility building, where it connects with electrically operated truck-mounted draw-out air-break 3-pole single throw breakers mounted in dead front metal-clad switchgear cubicles. Power continues through a high-voltage bus in this main switchgear assembly to distribution sections and then, through 3/c 300MCM feed-











ATOP EACH COLUMN a hydraulic jack is attached, threaded steel rods extending downward to engage lugs of steel collars incorporated into the slab.

ers, it continues at the 4160-volt level (1) directly to a 600-hp air-conditioning compressor, (2) to a 4160/440volt step-down transformer in another part of the utility building for heavyduty motor use, or (3) to 4160-208/120-volt delta-wye transformers located in penthouses atop the other 4 lift-slab buildings. This primary distribution system uses stranded copper cables rated for 5000-volt service, having tape and braid insulation, shielded when run indoors in conduit, and Neoprene-jacketed when run underground, in slabs, or in damp atmospheres. Wherever used, underground asbestos-cement feeder-distribution ducts are carried at least 21 feet below the level of finished grade. They are coupled to galvanized conduit ells or bends for all changes in direction, and they are accessible at frequent locations through 2-compartment manholes one section for power, the other for telephone service).

Since all lift-slab floor and roof sections are formed from lightweight 80psf concrete, the weight of substation, elevator and air-conditioning penthouse equipment is distributed over large areas through the use of channel grids, thereby keeping unit concentrations of loading well within the safety limits of the slabs. In all cases, penthouse substations include dry-type indoor transformers having Class B insulation, primary pothead terminals and secondary bus structures extending either to combination motor switch and starter racks, to penthouse power control boards, or to distribution breaker cubicles serving lower floor

Secondary distribution includes sev-

eral different mediums, these varying with the designed purposes of the five buildings. Therefore one finds branch power and lighting feeders run to local panels through the slabs; both 2-and 3-cell underfloor duct systems (for power, telephone and television distribution); both 440- and 230-volt plug-in busduct (with Vacu-break switch plugs for branch service to fan motors, lighting panels, etc.); also some trolley-duct for 60-amp 120/208-volt service for assembly departments using small power tools.

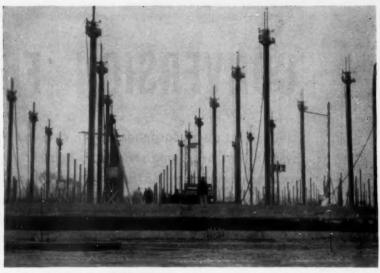
All concealed outlet boxes are zinc coated and amply sized, being 4 inches or greater in diameter and 3½ inches or greater in depth. The only exceptions are for light-switch receptacles in narrow partitions, where special shallow boxes are used, staggered in order to serve both sides of a partition







250-TON ROOF SLAB is raised as a single unit. Collars are then welded securely. View between separating slabs shows cleanness of waxed surface.



LIFTING CONTROL CONSOLE regulates operation of 12 jacks, indicates height of slab at each column position, provides operator with true picture of all forces in action. Two consoles "played as a duet" synchronize action of 24 jacks as slabs are slowly lifted into position.

with minimum thickness of panel. Conduits terminating in pressed steel boxes of any type have locknuts both inside and outside the box for positive rigidity. They are also fitted with approved bushings.

Since all lift-slabs have both an upper and lower mat of reinforcing steel, and since the underfloor duct system is installed between these two levels, extra-length leveling studs were required for all junction boxes, and special saddles were employed to raise ducts. Extra-depth collars were also necessary in order to reach the upper level of each slab.

In general, cabinets for power and lighting panels are of 12-gage zinc-coated sheet steel, with 10-gage stretcher-levelled front covers. All are dead front, with solderless lugs for feeder connections. Switches for lighting

branches are single-pole, controlling all phase legs of the system. All neutrals are connected to a solio setscrew bus, while breakers in power panels are 3-pole units.

In all 120/208-volt 4-wire systems, color coding specifies white neutrals and red, black and blue phase legs. In the 440-volt 3-wire installations, all three wires are black, as per code.

Lighting is essentially functional, using both industrial and commercial 4- and 8-foot slimline units in continuous rows, concentric ring silvered bowl suspended incandescent units, both flush-mounted or semi-recessed indoor or outdoor square lensed luminaires having symmetrical distribution, plus several other types.

This outstanding RCA lift-slab project won for Vincent Kling the Progressive Architecture Citation, and it offers many convincing arguments for extending the use of this new building method. It also writes outstanding chapters for electrical contractors Fischbach and Moore; consulting engineer Louis T. Klauder and Associates; the general contractor and builder, Turner Construction Company; and the Ohio Lift Slab Company.

To all electrical contractors, this project stresses the fact that they can no longer confine their interests and studies to their own field alone, but must keep abreast of new construction methods in other fields as well if they are not to become stagnant in thought or procedures. If they are to bid intelligently on new construction, anticipate previously unencountered problems, and have the solutions on tap for ready use, they must adjust their conceptions to keep pace with progress.





REDUCED HEADROOM necessitated placing suspended ceiling framework in contact with underside of deep beams, then using cramped space between ceiling panels and slab above for all lighting, air conditioning, electrical distribution, telephone and transcription equipment. Clearances were so critical that passage of conduits from bay to bay necessitated channeling of concrete covering on underside of steel beams.

CONVERSION FOR SERVICE

Underfloor ducts suspended from ceilings by inverted saddles, a lighting system that overcame structural headaches, plus a hat-full of installation methods devised by Hatfield Electric to solve problems in cramped quarters are features of the conversion of a ramp garage into a modern office building for the Standard Oil Company of Ohio.

By Hugh P. Scott

ANYONE visiting Standard Oil of Ohio's new accounting section would promptly rate it as one of Cleveland's most modern offices. This praise would be well merited, for an excellent lighting system provides an even 75 footcandles of shielded illu-

mination; closely-spaced floor outlets provide power for hundreds of large IBM, tabulating and addressograph machines; an acoustical ceiling cuts noise to a minimum; office-wide air conditioning keeps temperatures comfortably uniform throughout the year, and a high-key, cheerful atmosphere has been achieved through the use of light-colored wall and furniture treat-

ments, judiciously-placed murals, wood-veneer and structural-glass panels, hollow-steel partitions, cove and valance lighting, bright floor tiling and wall-to-wall carpeting.

Yes, those seeing the offices for the first time would be impressed, but those who are familiar with "what was" are amazed, for the space now occupied by this commercial show-place formerly

TRANSITION from garage to swank office involved leveling of floors, drilling holes for underfloor duct stubs, incorporating control panelboards with structural columns, installing combination fan-coil air tempering units below outer windows and recessing lighting troffers in the hung ceiling.



THE NEW LOOK presents broad, clean ceiling and floor areas, closely spaced power receptacles and recessed 2-lamp louvered fixtures, exhaust and Muzak ceiling units, and bright checkerboard plastic tiling. Duct system serving floor outlets is suspended beneath the slab.





CENTRAL HEATING is unnecessary, since BTU generation from IBM and other electrical machines provides full winter comfort in this bustling work area.



WINDOWLESS WALLS were brightened by drapes and top-lighted murals in executive offices; concrete walls were sheathed in wood veneers and structural glass; stepped acoustical ceilings were installed to cover multiplicity of beams, pipes and ducts, while wall-to-wall carpeting covers the concrete slab.

constituted the 7th and 8th floors of a mid-town garage—complete with deep structural beams, thick floor slabs pitched for drainage, inclined ramps instead of stairs or elevators, limited headroom, windowless walls, minimum illumination and only a few scattered plug-in receptacles for incidental power.

The necessity for this conversion was due to the fact that, today, jampacked down-town Cleveland has practically no vacant office space. In fact, although construction has been rampant in the suburbs and outskirts, no new buildings of any consequence have risen near the heart of the city for a quarter of a century. During this same period, however, business generally has experienced a lusty growth, and resulting expansion programs have placed terrific demands on all centrally located structures.

Therefore, when thriving Standard Oil of Ohio (doing 2½ times more business than a decade ago) started a search for 50,000 additional square feet of office space to house added personnel

and equipment, the chance of locating it anywhere near their headquarters in the Terminal Tower group was practically nil. But find it they did, and right next door at that, as a result of this unusual conversion job, some novel electrical distribution approaches, and practical installation techniques that were practiced by Hatfield Electric Due to the workmanship of that electrical contractor, and to the design and engineering ability of architects Garfield, Harris, Robinson & Schafer, this exemplary office became a reality.

Structural Headaches

Because of low clearance distances between garage floor slabs and the bottoms of deep beams supporting the floors above (7 feet 9 inches), it was impractical to reduce this dimension further by either building up floor levels to cover underfloor ducts installed in the normal manner on top of sub-slabs, or by suspending a false ceiling at any material distance beneath the beams. Therefore the full clearance was retained: first, by lay-

ing only enough concrete to level the drainage depressions in floor slabs; secondly, by establishing an acoustical ceiling level just clearing the undersides of beams. This decision was essential, yet it left only one possible place in which to install all utilities and services-that being the limited space lying between beams, floor slabs and hung ceiling panels. So into these cramped quarters went all underfloor ducts and wiring to serve the floors above, plus recessed lighting fixtures, air conditioning ducts, Muzak speakers, telephone circuits and control wiring for the floors below.

Availability of Power

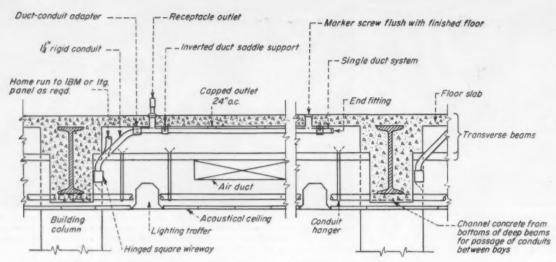
This conversion naturally called for a major boost in power demand but, since the entire building had been converted from direct to alternating current a year previously, and since considerable excess capacity had been provided at that time to meet possible future load growths, this requirement was not difficult to satisfy. In fact, a 440-volt switchboard already existed

CRITICAL SEE-ABILITY is obtained with satin-aluminum 2-lamp troffers on 6-foot centers recessed into the hung ceiling between overhead deep beams. Uniform intensities of 75 footcandles are provided with excellent crosswise shielding achieved with special "coined" louvers.



OUTDOOR ATMOSPHERE is created in interior lounge by judicious use of dummy window blinds and awnings, daylight lamps behind window coves, and marbelized tiling. Space is air conditioned, equipped with Muzak speakers and outlets for lamps, radio and hot plate.





LIMITED SPACE between bottom of floor slab and suspended acoustical ceiling was carefully planned to contain square feeder wireways, lighting troffers and air ducts running in

direction of deep beams, plus lateral underfloor ducts and bay-to-bay conduits placed in channeled I-beam sheathing. This concentration of services provides maximum clearance.

on the 9th floor so additional feeders were run from the basement substation to that point and all electrical service for the areas to be converted was obtained from that point through two feeders run in conduit from spare 400amp 3-pole switches to a sub-distribution point. From this new station, likewise located on the 9th floor but shifted to a point directly over floors being revamped, the two feeders were extended through unfused switches to (1) a 480-volt 3-phase 3-wire power panel and, via three single-phase dry-type delta-wye transformers to (2) a 120/-208-volt 3-phase, 4-wire lighting distribution center.

Power at the 480-volt level is used for essentially air conditioning purposes; serving two 100-hp refrigeration compressors plus related evaporation condenser fans and pumps. all associated with general area cooling; and also serving 10- and 71-hp unit air conditioners plus related water circulating pumps, exhaust fans and temperature control compressors, all of which are required for cooling local interior areas not served by the main air-distribution duct installation. Control of all this 480-volt equipment is by means of a variety of pressure switches, overload relays, timing devices and solenoids on 120-volt circuits. the stepped-down power for which is obtained through single-phase dry-type transformers that are connected on their primary sides to the 480-volt main supply, and are wall-mounted close to their respective load centers.

These central and local air conditioning units, operating at 480 volts,

serve all areas except a 20-foot-wide strip immediately adjacent to windows, since reduced headroom and the lateral placement of deep beams made it impossible to extend air ducts to these outer floor sections. For that reason, air conditioning for these areas is provided by fan-coil window units that are mounted below each sill and are supplied with fresh air through insulated air ducts that pierce the outer walls below each window. These window units operate at 110 volts, with adjacent units staggered between phases a, b and c of the 120/208-volt 4-wire lighting distribution system.

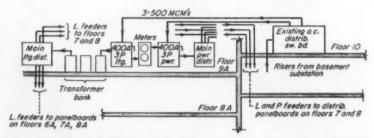
Inverted Saddles for Ducts

Branch feeders radiating from the main 120/208-volt lighting distribution center on the 9th floor are terminated at nine separate lighting panels, plus two panels used to control the large number of IBM circuits, plus two more control centers related to miscellaneous

pushbutton-operated motors. Panelboards used to control lighting only are equipped with 20-amp single-pole breakers and a common neutral bus, while IBM and similar panels have pull-out breakers, single- or double-pole as required. All panels are deadfront in construction; breakers are staggered in phase connection for proper load balance, and breakers may be easily replaced or shifted in arrangement without dismantling the boards.

For floor-wide distribution of this 120/208-volt power, an under-slab system of 4 by 4 wireways, underfloor ducts, rigid conduit, some EMT and a small amount of flexible armored cable is installed; serving heavy-duty floor outlets plus wall- and column-mounted convenience receptacles on the floors above and serving lighting fixtures and partition receptacles on the floor below.

As shown in the accompanying sketch above, 4 by 4 wireways are



POWER FOR CONVERSION was extended from a new ac switchboard in the basement to an existing distribution center, then via 500MCM cables to separate lighting and power breakers. Voltage of 440 was retained for heavy air conditioning equipment, while transformed current at 120/208-volts serves lighting, office equipment and miscellaneous loads.

mounted directly to the sides of the deep floor beams, so positioned that their hinged buttom covers can be lowered without coming in contact with the false ceiling. When closed, these covers are held in position by fixed bolts and butterfly nuts.

At 4-foot intervals, 14-inch rigid conduit sections sweep up and out at right angles from these square wireways, connecting through adapters to single-duct underfloor runs serving the IBM machines, tabulating and addressograph equipment. Underfloor duct sections extend from beam line to beam line, supported by inverted saddles bolted to expansion inserts in the slabs above them. For maximum rigidity, these saddles are located close to both ends of each duct run, also at all coupling points and at intermediate points not further apart than 3½ feet. Pre-set duct outlets are on standard 24-inch centers, although only about three outlets per 20-foot run are in use a 1¼-inch bit for drilling holes through the entire slab thickness to permit passage of the conduit stubs, and a 1½-inch bit for drilling an expanded shoulder just deep enough to receive the conduit couplings. Stubs, held secure by these shoulder-supported couplings, serve as yet another means by which underfloor ducts are rigidly-suspended.

After the installation of all wireways, ducts and floor outlets, markerscrew caps were set flush with finished tile flooring for location and identification purposes, and 1½-inch home-runs were extended from wireways to IBM and lighting control panelboards.

Minimum Clearance Dimensions

Inasmuch as acoustical ceiling panels are suspended almost in contact with the bottoms of beams, wiring between bays (for lighting, Muzak and telephone purposes) was complicated by extremely close clearance dimensions.

IBM Building panel No.1 Central air con--Wireway ditioning system distributes air via Wireway -- * -4 x 4 wireway ducts installed Duct end above false ceilings up to this trans--Underfloor verse line ducts IBM panel No. 2 Deen Office areas adjacent to windows ducts are cooled or Wireway heated by units located beneath each sill

DEEP BEAMS were a major structural problem, necessitating jig-saw juggling of wireways, ducts and branch circuits. Transverse beams also prevented floorwide-circulation of tempered air from the central air conditioning system, thereby creating need for window units along outer wall.

at present; these outlets being the two end ones plus a third one located at the approximate mid-point.

Use of Drills

Connections between these underfloor ducts and the heavy-duty floor outlets are established by means of 1½-inch conduit stubs and couplings. Holes for these stubs number approximately 550, and they were driven through the concrete floor slabs by means of electric drills equipped with hollow Carboloy bits that removed solid cores from the slabs. Two diameter bits were used for this purpose;

In fact, to permit the passage of conduits from one bay to another frequently required the channelling of concrete coverings from the lower flanges of encased I-beams.

Coined Louvers Reduce Brightness

Due to the critical see-ability required (for accurate tabulating, recording, filing and typing), it was essential that illumination be relatively high in intensity, yet generally diffused and low in brightness to minimize glare and eye fatigue. This combination of objectives was complicated however by the necessarily low mount-

ing heights of fixtures, so considerable thought and experimentation was expended before a satisfactory solution was determined upon.

This solution places deep Day-Brite Alzak satin aluminum 2-lamp reflectors in continuous rows, with troffers on 6-foot centers and running parallel to the deep floor beams, recessed into the false ceiling. With this close spacing of troffers, a fairly uniform 75-footcandle illumination level is delivered to all working surfaces, while the depth of troffers provides a satisfactory shielding angle for those employees looking at the fixtures from a right angle. Excellent lengthwise shielding is also provided through the use of closely-spaced transverse louvers containing small parabolic segments which are stamped or "coined" into both side surfaces of the aluminum fins. These cross shields diffuse reflected light so that troffer brightness is reduced by 50% when viewed longitudinally, yet effective illumination on working surfaces beneath the fixtures remains undiminished.

Since most of the employees working in these lighted areas are women, thought was also given to the color qualities of light, with the result that flattering warmtone slimline lamps were selected, operating at 430-milliamps. In all, 857 of these fixtures were installed, with lamp lengths varying between 4, 6 and 8 feet, depending upon overall lengths of troffer runs. Inasmuch as acoustical ceiling tiles may be removed at will, troffer lengths and their center-to-center spacings may be varied as desired to permit gaps for corridor, office lounge and service area partitions, and also permitting variations in lighting intensities for special departments or offices.

Code Minimums Exceeded

Throughout this entire installation, details related to the electrical work consistently exceed NEC minimums. Mains and feeder wiring is Type RH while all control and branch circuiting is Type T. All wiring is 12-gauge or larger; color-coded for identification and tagged in all panels and pullboxes. Splices occur only in junction. outlet or panel enclosures, with wires and cables run continuously between these approved splice points. And, when branch lighting circuits are occasionally grouped so that a common neutral can serve two or three circuits. care has been exercised in every instance to assure that hot legs are connected to different phases for proper load balancing.

[Continued on page 130]

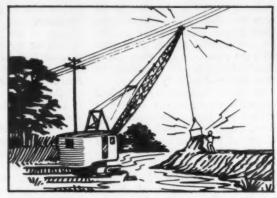
Why Contractors Should Be Interested In

Public Safety

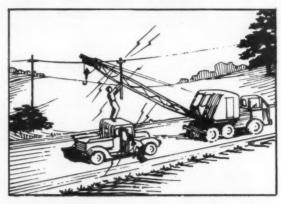
Many so-called electrical "accidents" have occurred when all codes have been complied with—caused by the carelessness or disobedience of the person who was injured or killed. Yet juries have placed the blame on many parties—including the electrical contractor who made the installation. Here is a realistic evaluation of a thought-provoking problem.



Chief Electrical Engineer Peter F. Loftus Corporation Engineering Consultants, Pittsburgh, Pa.



CONSTRUCTION WORK frequently involves the use of cranes, and accidents have resulted due to booms coming in contact with overhead power lines while persons on the ground were handling chains, cables or dredge buckets. Was the accident due to lack of proper instruction on the part of the contractor employing the crane?



LOWERING THE BOOM, rather than foolishly raising a high tension wire with a steel pole would have prevented this fatality, yet the jury placed the blame on the owner of the pole line, even though all existing codes had been complied with when the line was installed. Should our laws of responsibility be changed?

NVESTIGATION of causes resultting in human injury or death show that a high percentage of electrical "accidents" have been due to carelessness, lack of knowledge or deliberate disobedience to warnings or instructions on the part of the injured or killed individual. Yet court decisions have repeatedly placed the blame for these accidents upon the shoulders of the owner of a transformer, the manufacturer of a device, the landlord of a premise, the utility company operating a transmission line, or the electrical contractor who made the installationeven when it was proved that all existing codes and regulations governing the various installations had been com-

As a potential victim against such

unjust claims, the electrical contractor should have a vital interest in protecting the public against its own stupidity. Perhaps greater protection might be obtained by making codes and regulations more severe or by making the public responsible for facilities installed for public use or service. Tangible action along these lines has not been noted to date, yet it should be of interest to the informed contractor that serious thought is being directed toward this question.

In most instances where individuals have been seriously injured by coming in contact with overhead transmission or distribution lines or with associated facilities, the contributing causes can be traced directly to acts of carelessness, such as the following:

1. When workmen are in the acts of moving equipment, implements, and materials during construction work.

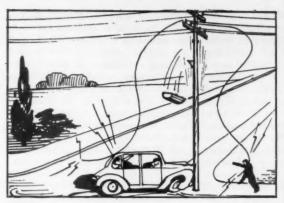
 When tampering inquisitively, or maliciously, with electrical facilities, equipment or objects without sufficient knowledge or without justification.

3. When youngsters perform acts of horseplay or accept dares to climb poles, structures, and guard fences, or to enter manholes, switch houses, and meter boxes or compartments.

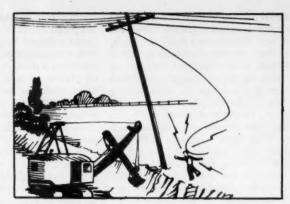
 When handling equipment, pipes, rods, and materials under and around overhead electric conductors.

5. When operating power shovels recklessly, thereby undermining poles and structures supporting electric conductors, buses, and facilities.

6. When employing inadequately de-



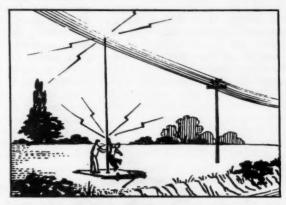
FREAK ACCIDENTS have been caused by falling transformers or live wires, with responsibility being placed on the Utility Company owning the pole line even though the shock that dislodged or snapped the equipment was completely beyond control of the power company. In these cases was responsibility justly placed?



EARTH REMOVAL can result in undermining poles, breaking underground duct lines, disturbing unmarked vaults and the like. Where does the responsibility rest—with the shovel or dredge operator, the engineers on the job, the earthwork contractor, the public being served, or the owner of the damaged property?



TELEVISION antennas are frequently improperly installed, poorly constructed or badly located, so that they sway or break under the forces of the wind, ice or sleet and thereby come in contact with high voltage cables. Such accidents have been blamed on the owner of the overhead cables. Should codes be made more rigid concerning inspection?



PULLING A WELL ROD from damp earth has also been the cause of death when the rod came in contact with a power cable. Should the jury place responsibility on the manufacturer of the rod, the power company, the foreman of the job, the contractor, the engineer who selected the well site or the owner of the power line?

signed, constructed or erected radio and television antennas in close proximity to transmission and distribution lines and their facilities.

7. When those with rifles, slings, etc., use line insulators and equipment on poles, substations, and other facilities as targets.

8. When amateurs with meager or little knowledge of electrical conditions attempt without authorization to remove, relocate, or adjust fallen wires, or make connections or reconnections to lines, services, and meters.

9. When in acts of plain vandalism. Numerous other acts which may be indirectly associated with the above may include entanglement of kites, pets or tree branches, which, when attempts to retrieve or free them are made, often

result disastrously. Then, there is the ramming of poles and other supporting structures by automobiles and trucks, causing the falling of lines, transformers, and other line facilities. Under this category, some very unusual circumstances surround the acts of the individual, such as of a car driver being pursued by a traffic patrolman, the car of the pursued leaving the road and striking a pole with sufficient force to dismount a transformer, causing it to fall on him. Even under such circumstances the blame has been known to be deliberately focused on the owner of the pole and transformer as an attempted means of pecuniary recovery.

A most frequent type of accident is that of road and highway construction shovel and crane operators coming in contact with power and distribution lines crossing over construction areas. Generally, no serious consequences befall the machine operator but his coworker on the ground, in holding or taking hold of ropes, chains, etc., as an upper member of the construction unit strikes the electric conductor, may be fatally or seriously injured. Many such accidents are not only a result of neglect on the part of machine operators but may be traceable to lack of supervision or education of the operators by the contractor for whom the operator is working. This may be said also of the shovel operator and the contractor in regard to shovel operation in excavation and stripping work where, without adequate preknowledge, the movements of the

shovel proceed to come in contact with overhead or underground wires and cables, or undermine poles and ducts. In this connection, incidents have been known where operators in moving cranes and shovels passing under lines have sent men up the boom with a stick to raise the power lines over the boom, rather than lower the boom, and pass beneath the wires without touching them. In these known instances, the man with the stick did not live to relate the incident, yet the owner of the power line has been known to be singled out, without particular reasons, as the offender.

T-V Brings New Problems

In more recent years, with the advent of television, annoying and serious consequences have resulted from inadequately constructed, mounted, and located antennas, on both apartments and houses. Many of these, seen in most any community, show total disregard for dangers of high winds, snow, ice, and sleet that might cause the antenna mast to sway or break and contact or fall into power and transmission lines. In some instances, such as at trailer camps, the antenna masts have been seen to be mounted on poles directly under high voltage lines. An instance has been known of the antenna, on having been found to be too low for best reception, being raised up through and between phase wires of the line. Here again the owner of the high voltage line had been set up as an offender, although he knew nothing of the intentions or acts of the injured.

Kite-flying seasons bring with them numerous incidents of injuries to boys attempting to retrieve kites entangled in overhead wires in lines and substations. In most areas, annual educational campaigns have resulted in a great reduction in injuries and fatalities from this cause. However, some very foolhardy acts have been known where elders did not heed the dangers that they so forcefully taught youngsters to regard.

Citing such a case, a child's father proceeded to retrieve a kite from a high voltage line, using an iron pipe and, seeing this pipe to be too short to reach the kite, obtained a steel wire to project beyond the upper end of the pipe. It reached the kite and the wire, but he did not see his child, kite, or family again. Here again the owner of the line was cited as an offender, although the line and its construction details exceeded established safety regulations.

Incidents similar to the foregoing are too numerous to mention; and, because of their frequent occurrence, the question may be asked as to when does the public accept responsibility for injuries sustained by coming in contact with transmission and distribution lines erected by a utility, government agency or private company to provide electrical service to the public. Through representatives of the public, various rules and regulations are drawn up as codes by national, state, and municipal authorities, establishing safety measures for electric utilities, contractors, and electricians to follow and adhere to for installing and operating transmission and distribution lines and their facilities by practical means. It then may be asked: What are the factors that determine the "most practical means"? This question is all important, as it has to do with many fundamentals which involve the interests, desires, and needs of the public as consumers of electrical energy.

If the present most practical means of distributing electrical energy to and for the use of the public is accepted, as it has been to date, there are practically no boundaries beyond which electric service can be extended. That is to say, those in rural, less inhabited areas can and do enjoy modern advances by using electrical energy to reduce burdens and drudgery, and to gain knowledge and culture through mediums of communication, radio, and television.

Underground Distribution Costly

If, on the other hand, the public had not accepted the present common, most practical means of transmitting and distributing electrical energy, and had, instead, made more stringent regulations such as requiring all overhead lines to be placed underground, then it is not beyond reason to point out that both the electrical industry and the public would have suffered the loss of many great developments of modern science that have proven so beneficial. As we know and think of it today, and will do so for a long time in the future, the cost of placing all transmission and distribution lines underground is prohibitive for electric systems as a whole, and would result in the public, beyond limited areas in cities and large towns, not being able to obtain power service. This can, therefore, be given as the most logical answer to the question which usually arises following accidents by contact with overheated lines, namely, "Why don't they put them underground"?

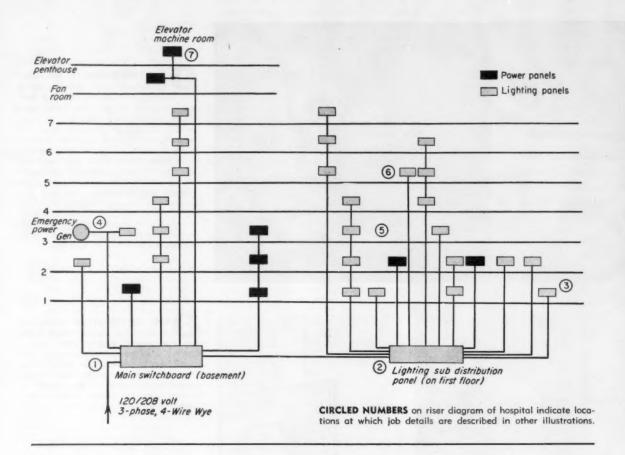
Considering the public as a whole, the number of injuries from individuals coming in contact with overhead transmission lines represents a very small percentage of the total population. Yet, small as it is, it deserves attention, for the saving of a single life through any possible practical medium becomes of great importance. Constant safety measures and campaigns to enforce these measures must be practiced; and where danger lurks in the vicinity of construction work, the contractor must accept a measure of responsibility and give adequate instructions and supervision to machine operators and other men working in proximity to any dangers. Generally, and particularly on road and highway construction work, the locations and clearances of existing overhead lines are made known to the contractor before he bids on the work. As a part of public responsibility, adequate supervision must therefore be included as a part of the work the contractor does or is to do for the public or others.

Need for Safety Promotion

In the present wide use of electrical appliances and power machinery, which have been accepted for their many advantages, the electric utility companies, private or otherwise, in spite of and because of greater general public knowledge of electrical devices and facilities must carry on more vigilantly than ever with campaigns to advise the public as to the proper use of electrical services and facilities. Separate, individual efforts would relate to and be for the benefit of (1) contractors and their machine and equipment operators in numerous types of construction and excavating jobs; (2) inquisitive, tampering and bantering individuals; (3) general types of workers handling materials near power and distribution lines and substations; (4) general public involved in applying and maintaining radio and television antennas; (5) general types of individuals prone to adjust service wires or meters; (6) children flying kites, and climbing poles or guard fences; (7) rural and farm people placing or handling well rods and implements in the vicinity of power and service lines.

Stricter Inspections in Order

A most recent hazard created by the public is that of the radio and television antenna construction. The public, through its city and town officials, must exact some regulations (such as to have all antenna installations approved as to design, construction, and location) with special safety considerations being required when transmission and distribution lines or their facilities exist in close proximity to proposed antennas.



ON THE JOB AT . . .

Kaiser Memorial Hospital

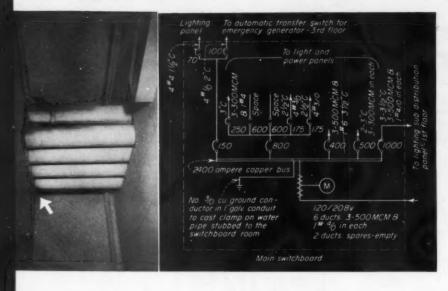
A photo-and-diagram roundup of electrical system details in the construction of this new, ultra-modern hospital, San Francisco, California.

By Earl W. Peak, Vice President, Central Electric Co., Inc., San Francisco, Calif.

Construction of the new Kaiser Memorial Hospital provides background for a study of modern electrical practice in distribution and utilization wiring for a hospital. Here, a flexible electrical system is installed to service a wide range of utilization devices. Extensive control and signal circuitry is as prominent in this installation as the robust

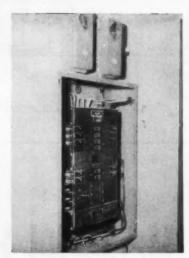
feeders and distribution panels which supply basic light and power. The accompanying illustrations pinpoint some of the elements in this thoroughly electrical hospital.

Architects of this hospital were Wolff and Phillips, Portland, Oregon; Consulting Electrical Engineers were George Pettingell, Grant Kelley and Co., also of Portland.



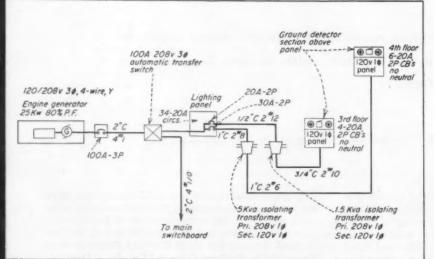
ELECTRIC SERVICE to the hospital consists of six sets of conductors, three 500 MCM and one 4/0 neutral conductors in each set. Each set is fed in one 31/2-inch fiber duct encased in two inches of concrete, down 18 inches below finished grade. In addition to the six duct runs in use there are two spare ducts. These eight fiber ducts are tied into the main switchboard by lengths of 31/2-in rigid steel conduit which enter through the basement wall and are coupled to the switchboard enclosure (ARROW). Ground clamp connection to conduit can be seen at top of photo. Main switchboard contains breakers for various feeders as shown in diagram.





sub distribution panel in mechanical equipment room on the first floor houses lighting feeder breakers. Fed from the main switchboard, this panel supplies lighting panels on floors 1 through 7. As shown here, considerable spare breaker capacity was allowed in the cabinets for future load growth. (Shown at far left)

LIGHTING PANEL, mounted alongside the sub distribution panel on the first floor, contains eleven CB's for stairway and outside lighting circuits. Time switches mounted on top of the panel control the circuits: one switch for two circuits to front parking lights; the other for stairway lights. Time switches are used extensively for control of circuits from many of the lighting panels throughout the hospital. Roof floodlights are on a time switched circuit from a sixth floor panel; solarium lights and parking area lighting are circuited through time switches from panels on the first, second, third and fifth floors. The panel shown and other panels throughout the building have space for additional breakers; the enclosure also has more than ample capacity.

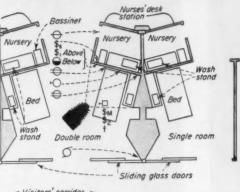


from an engine generator hooked up as shown. The generator is located in a room in the rear of the third floor of the building. As shown, a 34-circuit lighting panel and isolated circuits in operating-room areas are fed from the generator in case of emergency.

Legend

- O- Nurses' call dome light
- Recessed night light
- Duplex convenience receptacle
- → Bracket light outlet

 → Radio outlet
- \$s-Signal light switch
- \$,- Night light switch
- \$2- Switch for up-light
- \$4- Motor control (dropes)
- Nurses' call receptacle for plug-in bed cord
- Receptocle for plugging-in draw-drape motor



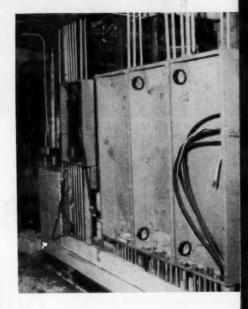
← Visitors' corridor →

Outside glass wall of building

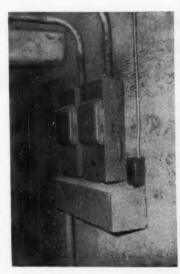


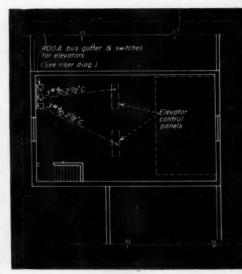
FLOOR SECTION on maternity floor of hospital shows layout of double and single rooms with wide range of electrical facilities. There are no wards in the hospital; all bed-patient floors are made up of double and single rooms (camera view shown for photo at right). Each bed, not shown in the photo but indicated on the sketch, has a motor for raising and lowering the head and foot of the bed. This motor is normally plugged into the duplex convenience receptacle near the base of the wall. One of the outlets shown over the counter of the wash stand provides radio programs for pickup by a plug-in receiver unit. Motor operated draw-drapes are installed on the inside of the sliding glass doors which open on the visitors' corridor. The motor for the drapes on each side of the room is separately controlled by a two-position forward and reverse switch on the wall over the wash stand counter on the same side. As shown, each baby has his own private nursery. This room is equipped with a special wash stand, a germicidal lamp and a bassinet on rollers. The bassinet can be pulled out of the nursery into the bedroom, immediately alongside the bed. When the drawer-like bassinet is pulled into the bedroom a switch is actuated, lighting a signal light to inform the nurse that the baby is in the bedroom. Several types of nurses' call dome lights are used, all tied into a central control board for the call system. The plate shown on the wall alongside the lighting fixture in the photo covers an outlet for oxygen which is piped through the buildings. There are fourteen double rooms and five single rooms on the maternity floor.

INSTALLATION DETAIL is shown here of the local panelboards serving kitchen area on the fifth floor of the hospital. When completed, the three large enclosures will contain a total of 64 CB's, two- and three-pole units up to 70-amp ratings, feeding light and power circuits. The group of three panel enclosures in the foreground is fed by three 250 MCM and one No. 4 conductors in 3-inch conduit. The smaller lighting panelboard at the left is fed by a separate riser of four No. 3/0's and serves twenty-two 20-amp, single-phase circuits.



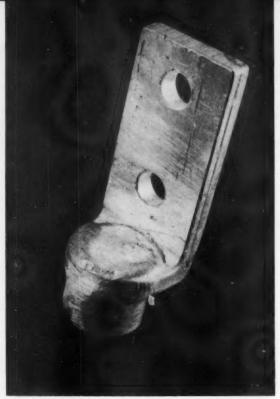
ELEVATOR DISCONNECTS are located in the elevator machine room on top of the building. Riser from the main switchboard feeds the three switches through 400-amp bus gutter. Smaller switch at right is a 30-amp unit protecting elevator control circuits and fused at 20 amps; larger units are 400amp switches fused at 210 amps, supplying power to elevator motors. A tap from the elevator riser is made in the fan room on the floor below. There a power panel feeds a 44-hp fan load. The feeder to the combined elevator and fan loads is a 31/2-inch conduit containing three 500-MCM and one No. 6 conductors. Power panels feeding additional fan and other motor loads are located on the first and third floors.







ARGON WELDING process is used to weld an aluminum lug to the end of a stranded aluminum cable. Small cup formed by cable depression in lug sleeve is filled with molten metal to form solid weld.



VIBRATION-PROOF terminal connection results from welding process. Aluminum cable strands and aluminum lug sleeve become a single homogeneous mass of metal, solving cable to lug contact problem.

Properties and Use of Aluminum Cables

The future may bring increased use of aluminum cables in electrical distribution. This resume is offered as a guide to those who may consider this step in their design and installation work.

By Leo Dolkart

Electrical Engineer Commercial Light Company Chicago, Illinois

THE INCREDIBLE increase in use of electrical energy during the past decade—for industrial, commercial and residential applications—and the anticipated steady rise of that utilization curve means that a lot of conductors and cables will be installed in the next 15 to 25 years. It is reason-

able to assume that a substantial portion of these conductors will be aluminum. Availability of raw material, economic factors and demand will dictate a place for both copper and aluminum in electrical distribution systems. Ores from which aluminum is made make up more than 9% of the earth's crust. Aluminum conductors have a conductivity of slightly more than 63% of that of copper and are much lighter in weight. Price comparisons are favorable.

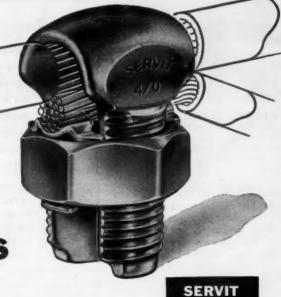
Aluminum cables were first used as

conductors late in the 19th century. Both here and in Sweden, much experimental work was done in the use of bare aluminum conductors for high tension transmission lines. Since at high voltages the current tends to flow along the periphery of conductors, it was reasonable to use larger but lighter cables. In fact, some experimental work was done with tubular aluminum conductors. Today, practically all transmission lines of 100,000 volts or over use aluminum cables—many reinforced with steel.

Why are these the most widely-used

connectors

in America?



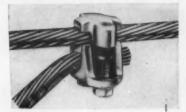
Because Burndy Servits and Oklips are engineered of high-strength alloys - to provide the high mechanical strength that assures sound electrical connections. Because they're compact - easy to install, easy to tape. Because they withstand overload, vibration stresses, corrosion conditions, and high tightening torque so they can be used over and over again for splices, taps, deadends, light or heavy-duty service connections - indoors or outdoors. Because they're U.L. listed. Because Servit and Oklip variations are designed to accommodate any combination of copper, aluminum or steel conductors.

> For long years of trouble-free service connections, it pays to specify Burndy Servits and Oklips. And be sure you get them!

ALWAYS . . . consult Burndy Catalog 52-your basic source of all connector information.

BURNDY ENGINEERING COMPANY INC., NORWALK, CONNECT.

BURNDY CANADA LTD., TORONTO 8, ONT.



SOLDERLESS CONNECTORS of the bolted or screw type squeeze conductors between connector body and contact plates as bolts are tightened, are used frequently on smaller size cables.

Until a few years ago use of aluminum cables was restricted to non-insulated types. During the last few years, however, use of insulated aluminum cables in industrial plants has increased. Experience with the first hard drawn wires in the smaller sizes did not prove satisfactory owing to conductor breakage when fastening at terminals. Some breakage was also experienced in pulling such wires into long runs of conduits. While the National Board of Fire Underwriters approves aluminum wires as small as No. 12, the smaller sizes are not popular. The main advantage in the use of aluminum cables will be found with the larger sizes, particularly the stranded types. Since about 1947 the increased facilities for the production of aluminum has lowered the perpound-cost of the metal, which has induced cable manufacturers to use this material at an ever increasing tempo.

Today, the somewhat restricted availability of copper for electrical conductors has compelled industrial and commercial users to substitute aluminum cables for copper. To the uninitiated, this apparently presented no new problems. Many used this cable with standard copper fittings previously designed for copper cables. Many substituted aluminum cables, often without much consideration for the difference in carrying capacities or other physical differences between aluminum and copper.

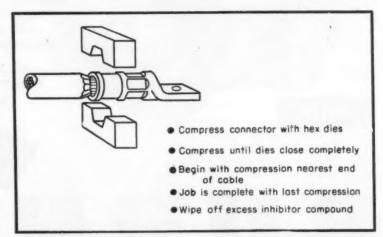
Let us consider some of the essential differences between these two metals as regards their use for electrical conductors. Some facts compiled in a report by Dr. E. G. Sturdevant, chief engineer of the United States Rubber Company, are presented in Tables I, II, and III.

Table I shows the relative sizes of copper and aluminum cables for similar voltage drops on a phase to phase per ampere per 1,000 ft. basis when used in a magnetic conduit. Table II shows conduit sizes for three conductors of equivalent current carrying

TABLE I

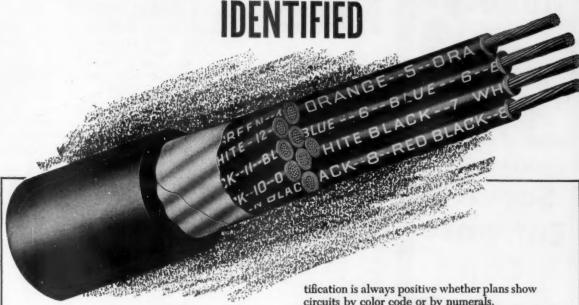
Equivalent aluminum and copper conductors based on voltage drop on three single conductors enclosed in a magnetic conduit 80% power factor, 75°C. Copper temperature and corresponding current-carrying capacities at 30°C. ambient.

Copper Conductors			Aluminum Conductors		
Size	Voltage Drop Phase to Phase per Ampere per 1000 ft.	Amperes	Size	Voltage Drop Phase to Phase per Ampere per 1000 ft.	Amperes
14	4.67	15	12	4.75	17
12	3.00	20	10	3.02	25
10	1.86	30	8	1.90	38
8	1.21	45	6	1.21	55
6	.793	65	4	.790	71
4	.514	85	2	.509	97
2	.341	115	1/0	.336	126
1/0	.232	150	3/0	.228	168
2/0	.193	175	4/0	.190	193
3/0	.163	200	250MCM	.169	214
4/0	.138	230	350MCM	.134	260
250MCM	.126	255	400MCM	.124	282
350MCM	.104	310	500MCM	.108	319
400MCM	.097	335	600MCM	.098	353
500MCM	.088	380	750MCM	.089	399
600MCM	.082	420	900MCM	.082	437
750MCM	.075	475	1000MCM	.080	458



HIGH COMPRESSION TYPE connectors form sleeve of lug around cable strands under high pressures produced by special hydraulic tools with dies operated by hand cylinder or power-operated hydraulic pump. Inhibitor compounds are used on these as well as bolted types.

Roeplastic control cable-THE ONLY CONTROL CABLE WITH CIRCUITS OSITIVELY



THIS NEW Roebling ROEPLASTIC Control Cable makes circuit identification quick and certain for the first time in history. A workman can't go wrong even if he's color blind. Here's why:

In ROEPLASTIC Control Cable, each conductor is identified from end to end by both its IPCEA code color name and its individual number by means of an indelible printing against a strongly contrasting background. The printing is permanent; it cannot fade or rub off...idencircuits by color code or by numerals.

Roebling ROEPLASTIC Control and Signal Cables are ideal for such purposes as remote control of motors, switch gear, automatic machinery, etc.... for traffic light control, relay, metering and supervisory circuits. They are made in constructions, types of insulations and over-all sheaths to meet every specific requirement. Write for technical data...and order ROEPLASTIC Control and Signal Cables from your Roebling distributor. John A. Roebling's Sons Corporation, Trenton 2, N. J.

Subsidizry of The Colorade Fuel and Iron Corporation





TABLE II

Conduit sizes for three conductors of equivalent current-carrying capacities

Coppe	r	Aluminum	
3 - No. 6	1"	3 - No. 4	1 1/4"
3 — No. 4	11/4"	3 - No. 2	1 1/4"
3 — No. 2	11/4"	3 - No. 1/0	2"
3 - No. 1/0	2"	3 - No. 3/0	2"
3 - No. 2/0	2"	3 - No. 4/0	2 1/2"
3 - No. 3/0	2"	3 - No. 250MCM	21/2"
3 - No. 4/0	21/2"	3 - No. 350MCM	3"
3 - No. 250MCM	21/2"	3 - No. 400MCM	3"
3 - No. 350MCM	3"	3 - No. 500MCM	3"

capacity. Table III presents a comparison of physical properties of aluminum and copper.

While the volume conductivity of aluminum is 63% of that of copper (coated), based on their resistance it is about 80%. The National Electrical Code permits aluminum cables 84% the current carrying capacity of the same size copper conductors. Thus, to match the current rating of a No. 1/0 copper wire, a No. 3/0 aluminum wire would be needed. Substitution for a 500MCM copper cable would require a 750MCM aluminum cable.

Size for size, aluminum cables are less expensive than copper. On the basis of current carrying capacity, however, costs are commensurate. Also, when aluminum cables are used conduit sizes may be larger and the costs may increase.

Connection Problems

As to its physical properties an aluminum electrical conductor offers certain differences, some quite essential, from that of copper. Copper oxide, which forms on copper when exposed to the atmosphere, is a conductor of electricity and, in a measure, presents no difficult problem when it occurs at terminals of insulated cables. In the case of aluminum the situation is entirely different. Aluminum oxidizes very quickly when exposed to the atmosphere. Once formed, this oxide stops further oxidization. In itself it is an insulator and hence requires special treatment at terminals of cables. Since this material oxidizes so readily, mere cleaning of the cable is not sufficient. for it will reoxidize almost immediately. To stop this process of oxidiza tion certain types of greases or oils must be applied to the cleaned end of the cable or conductor. As is well known, greases are of themselves also non-conductors. So terminals must be used that enable sufficient pressure to be exerted on the cable that will drive away the grease from the surface of contact and still prevent the formation of oxides.

A practical way of solving this problem is to use a form of metallic pressure type of connector. For this purpose there are a few connectors

TABLE III
Relative strength of aluminum and copper

	Semi-Annealed Aluminum	Semi-Annealed Copper
Tensile Strength per sq.inlbs.	17,000-22,000	35,000-38,000
Specific Heat cal.per gr.per degree C	0.226	0.092
Specific Thermal Conductivity cal/cm²/cm/Deg.C/sec	0.520	0.923
Specific Gravity	2.70	8.89
Pounds per 1000' per Cir. Mil	0.00091	0.003
Pounds per cubic foot	169.0	555.0



How Metalclad Switchgear

PAYS FOR ITSELF IN HALF THE

at the University of Louisville

THE University of Louisville recently completed the initial phases of modernizing its electrical system. This program provided for replacing six 110/220-volt metering stations with a high-voltage switching center where the incoming service is metered at 13.5 kv. The University is now saving at the rate of several thousands of dollars annually in electric power costs—and as projected additional loads are added, the annual savings will be still further increased.

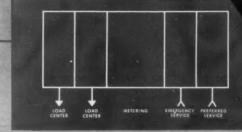
The low initial cost of S&C Metalclad Switchgear—used for this new switching center-makes it possible for these annual savings to pay for the switching center very quickly.

Don't let your plans for modernization or new construction crystallize without first finding out whether S&C Metalclad Switchgear can provide the protection and switching you need. Information about S&C Metalclad Switchgear is contained in this booklet . . . send for a free copy . . . yours for the asking.

Mr. R. S. PURVIS, Superintendent



of Buildings and Grounds for the University, proposed the modernization of the University's electrical system. He said, "We chose S&C Metalclad Switchgear because of its low initial cost, its safety, and the fact that it is very easy to add to when additional loads require it."



THE UNIVERSITY OF LOUISVILLE

switching center provides (1) manual switching on preferred and emergency circuits, (2) metering of the 13.5 he service, (3) protection and switching of feeders which supply outlying load centers from which 110/208-volt lighting and power service is provided to surrounding areas.



S&C Electric Company 4433 Ravenswood Ave., Chicago 40, Illinois

Please send me your new booklet on SaC Metalclad Switchgear, No obligation on my part, of course.

Name

Company_

City_ Zone_ State



Meet the big new favorite—Klein Climbers fully shaped to the contour of calf and ankle. That means a firmer, closer fit...a greater measure of safety. There's a new shape to the extra-wide stirrups also, for more comfortable arch support. Klein Climbers are made of forged steel, individually tempered and tested—aluminized for weather protection. Matched in pairs—adjustable length patterns 15 to 18 inches, specify 1945-ADJ—fixed length patterns 15 to 18½ inches, stock sizes specify 1945.





KG NO. 1 GAFF GAUGE Keep this precision gauge handy for a safetycheckonproper spur pitch. Plated steel—packed in durable plastic case. 1901-MG GAFF GUARDS
Protect the all-important spur of your
climbers with this
new Klein gaff guard.
First quality leather
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Instructions for sharpening gaff included,
ASK YOUR SUPPLIER

Foreign Distributor: International Standard Electric Corp., New York.



available made of aluminum or copper. Owing to its lower conductivity aluminum connectors must have a larger contact surface when fastened to copper bus bars.

The use of plain or untreated copper connectors with aluminum cables presents another problem. Copper and aluminum occupy different positions in the electromotive series. In the presence of moisture a galvanic action is likely to be set up between these two metals to the detriment of both and increase the heating effect of the contact. To eliminate all such galvanic action, copper connectors must be either tinned, zinc or cadmium plated.

Here is a word of caution to users of early installations of aluminum cables when ordinary copper terminals were used. Have these terminals or connectors replaced with either aluminum connectors or with copper tinned connectors.

Since the thermal expansion of aluminum is greater than that of copper, aluminum cables will elongate to a greater degree than those of copper. In ordinary commercial conduit installations no difficulty will be encountered in this respect provided sufficient pressure is applied to the terminal fastenings.

When facilities are available aluminum conductors may be soldered to aluminum terminals. In such cases an aluminum soldering flux is applied to the cable end which destroys the oxide film of the conductor and terminal or lug. The terminal is then heated to about 410°F when the solder is applied.

When soldering joints or terminals it is best to follow certain procedures as outlined by the Aluminum Corporation of America. Special solders as well as fluxes must be used. These are effective in removing the aluminum oxide film, are non-corrosive and consequently do not have to be removed themselves.

In industrial projects where many

joints or terminals are to be made up, it may be found more economical to use argon are welding for this work.

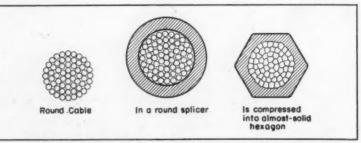
There are two general types of pressure connectors for aluminum cables. One uses bolts; the other a compression sleeve.

In the ordinary type of pressure connector, pressure is exerted by one or more screws or bolts and applied either directly to the cable or to a plate which contacts the cable. This latter type is much superior to the type that applies pressure on the cable by means of a screw. In cases where a plate or plates are used, the area of contact is much greater and hence is more effective.

Where many joints are involved and it is desired to use a true compression connector, the high compression type is more satifactory. With this connector, a mechanical or a hydraulic pressure upon the connector sleeve around the bare conductor. Pressure varies from one ton to as much as 40 tons and sometimes even more. In this method the individual wires of a stranded cable are compressed from a cylindrical form to an irregular shape to make an almost 100% area of contact between adjacent strands.

There are several types of greases, oils or oxide preventives on the market specially compounded for use with aluminum cables. Some are effective and some are not. However, these should be used as ordinary greases or oils

One solution to the connection problem is the continued cooperation of aluminum cable manufacturers and manufacturers of connectors and lugs to provide a more readily available supply of connectors in the commercial markets. At present, it is very difficult to obtain tinned copper connectors for aluminum cable use and aluminum connectors are available only on long advance order.



GREATER CONTACT area between cable strands and between cable and connector sleeve is one advantage of compression type connectors. Hydraulic pressures of one to more than 40 tons (depending upon size of cable) compress cable strands and connector into almost solid mass.



When management says: "Cut operating costs"... here's how we can help you

When management tosses this problem in your lap, the sum total of many factors must be determined. And more than a review of the electrical system is involved.

To really lower operating costs calls for an overall analysis—the relationship of power to many other plant areas. In scope, this can run from a review of production methods and machines to a detailed check of maintenance costs and down time. That's where we, your Westinghouse Distributors, can help. Backed by the Westinghouse engineering and service staff, we offer you an "all-through" plan. From problem analysis through system design and equipment, installation and operational proof, we work closely with you to bring about cost-cutting practices.

Specific examples of how we can do this are shown on the next pages.

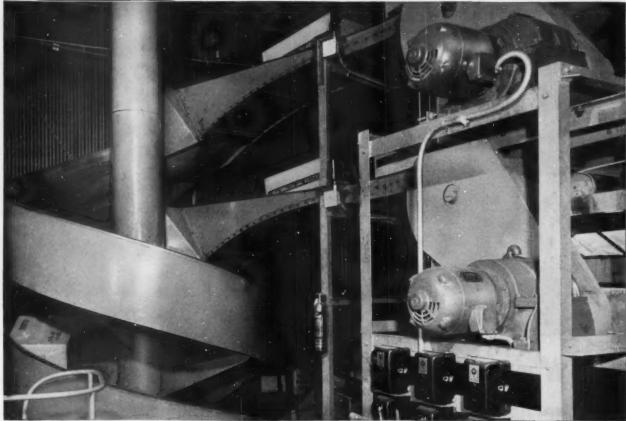
DP-5001-A

Westinghouse





"Look first at the <u>drives</u> behind production equipment . . . here's where costs can be cut."



Motor operating costs down 51.5% after Life-Line® Motor installation

In terms of dollars per year—per 100 motors—a plant survey showed that Westinghouse Life-Line Motors result in a \$693.58 operational savings over conventional a-c types.

Yearly outage rate for the conventional motors was \$1,348.62. On the 100 Life-Lines, it totaled \$655.04. That's a 51.5% slash in motor operating costs.

This performance record is due to the greatly improved design and structural materials. In addition, Westinghouse Life-Line Motors require no lubrication. They are equipped at the factory with pre-lubricated bearings—sealed with a lubricant that inhibits oxidation or deterioration.

Once a Life-Line Motor is installed, the plant can forget about periodic greasing. And the motors can be mounted out of the way.

Westinghouse Distributors—with proved Westinghouse engineering backup—can give you many answers on motor costs.

DP-5001-B

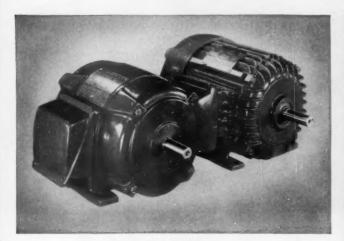
Here are more concrete examples, showing how intelligently engineered Westinghouse products save time and money for installers and operators...



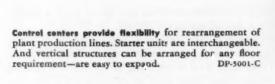
AB-I circuit breakers provide complete protection against short circuits and high overloads. They can be reset quickly and safely after fault is cleared. Available for practically every NEMA application.



Change-over to AB-I breakers saved \$5319 the first year here. Yearly outage with fuse protection was costing \$5408. Westinghouse Circuit Breakers were recommended—dropped outage overhead to \$89...a 98% saving.



Life-Line "A"—newest addition to the Westinghouse motor line. Offers the many Life-Line savings and advantages . . . with new features to meet the ever-growing progress of industry. A power package that guarantees better performance.





YOU CAN BE SURE... IF IT'S
Westinghouse



"From the meter to the load, coordinated Westinghouse products save installation time and operating expense."





By applying Inerteen® Capacitors, power bills dropped nearly \$4000

Many plants-like this Midwestern concern-are amazed at how much improved power factor can lower operating costs.

The capacitor bank, here, is one of eight installed. They total 720 kvar and have raised power factor from 69 to 95%. Result: Motor performance improved through better voltage regulation. Power

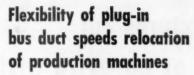
bills have been cut by an average of \$315 a month -an annual savings of \$3780.

Westinghouse Inerteen Capacitors will bring similar savings wherever inductive equipment is used. They do it by applying nonproductive current direct to the load. This permits more of a system's capacity to carry useful working current. DP-5001-D

YOU CAN BE SURE ... IF 178 Westinghouse @







As part of an expansion program, an eastern plant was relocating its production machines. Further analysis showed how Westinghouse Plug-In Bus Duct would help minimize the job.

Due to the flexibility of plug-ins every foot, power was taken temporarily from the duct. And the plant moved 139 machine tools with less than five minutes down time per operator.

Up to 10-foot lengths, Westinghouse Bus Duct comes in prefabricated sections. It installs easily with cantilever hangers and can be expanded or relocated. Available in two types that accommodate all load and service requirements.



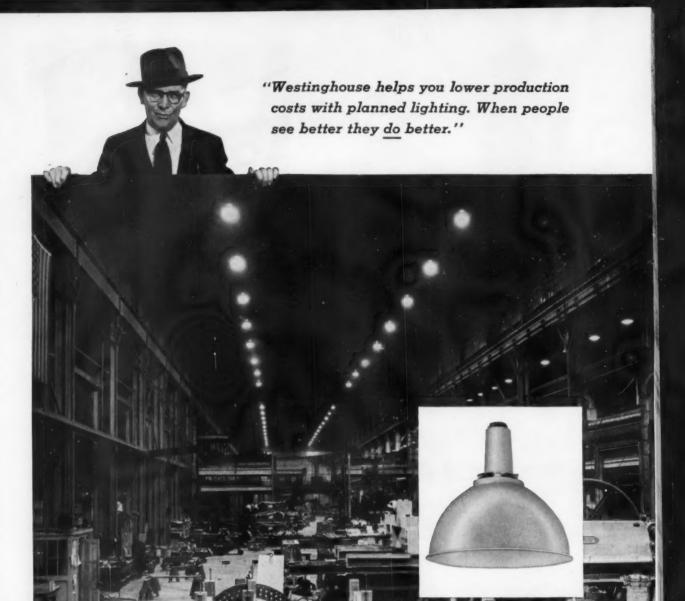
Installs quickly. Three men using a fork truck installed 755 feet of bus duct in four days at this same plant. Installation savings benefited not only the user but contractor as well ... resulted in an additional lighting installation.



Power take-offs easy. Here's how easy it is to take off power from Westinghouse Plug-In Bus Duct: Slide cover away from plug-in receptacle... then plug in and fasten unit to duct.

DP-5001-E

And here's how good lighting pays off ...



Ventilated mercury high-bay fixtures cut maintenance...give more light at no extra cost

The modernization need at this Pennsylvania plant: Better lighting with less maintenance. The answer: A Westinghouse Ventilated Mercury High-Bay lighting system.

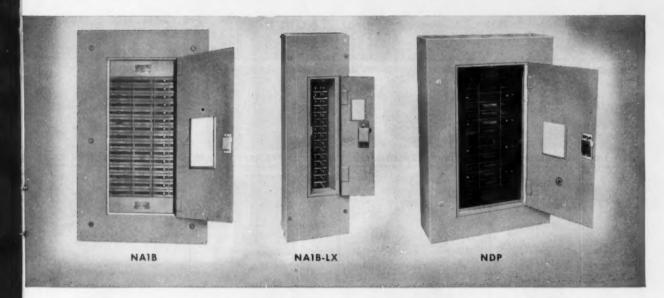
Mercury sources provided approximately three times more light than the previously used incandescent design—and last seven times longer. At a 48-foot mounting height—the case in this plant—this becomes exceedingly important.

Additionally, the ventilated luminaires help keep reflectors clean . . . yet protect the lamps and provide a controlled lighting distribution system to meet the specific application requirements.

Planned lighting *does* mean economy. The seeing requirement dictates the lighting system and equipment to be used.

Your Westinghouse Distributor stands ready to help you with your lighting problems—whether they involve the shop, office or parking lot. DP-5001-F

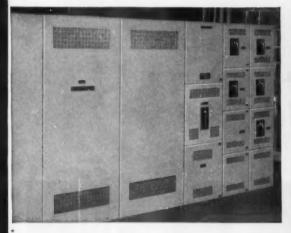
Here's more matched Westinghouse equipment: Drytype power centers to bring high voltage closer to the lighting load . . . and modern circuit breaker panelboards which offer complete protection to lighting circuits . . .



Westinghouse AB De-ion® Circuit Breaker Panelboards give dependable protection to lighting and power circuits. There is a complete line available for surface, flush or column mounting. Circuit capacities range from 15 to 600

amperes, up to 600 volts a-c or 250 volts d-c in panels with either main lugs or main breakers. They cut down time because there are no fuses to store, match to the circuit or replace. A flip of the breaker handle puts you back in service.

DP-5001-G



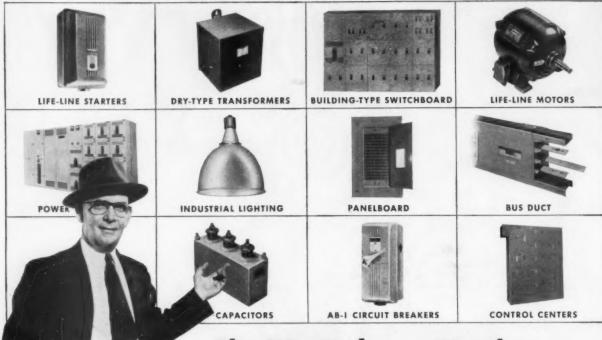
Westinghouse Power Centers assured more production output per kwhr used at an eastern metal-working company. This was brought about by improved voltage conditions and reduced line losses.

Dry-type power centers reduce operating costs. They combine transformer and circuit protecting equipment in a single unit—spotted close to the loads. Secondary runs are shortened; line losses lowered.



Westinghouse





The Westinghouse Distributor in your area offers you a complete electrical service

Regardless of your location, a Westinghouse Distributor is nearby—ready to serve your electrical needs.

He offers you from a single source a complete line of electrical equipment—coordinated Westinghouse products that install easily, feature both simplified and standardized design.

And through your Westinghouse Distributor you can get the engineering and product advice you require to help bring about better, more economical plant operation.

Put these combined services to work on your plant modernization programs. One call to the Westinghouse Distributor in your area does it.



Teams of Westinghouse Engineering and Product Specialists from the headquarters organization are available through your Westinghouse Distributor. Their mission: To help you analyze modernization problems . . . and select, coordinate and apply equipment.

DP-5001-H

Westinghouse



Practical Methods

Temporary Power Posts Serve Electric Tools

CONSTRUCTION

Furnishing temporary power is a factor to be considered on practically all building construction projects. Specifications generally require the electrical contractor to provide a temporary wiring system for use of all trades working on the project and to include the item in his estimate. The cost of providing such facilities will vary with the size and type of project and—to a considerable extent—upon

the manner in which the contractor installs the system. A haphazard approach can lead to an inadequate system and considerable "on the job" maintenance to satisfy the needs of all who use the facilities. An engineering approach plus a bit of job organization can keep this cost to a minimum and make it easier to estimate this item on future jobs.

On the new City-County Building project in Detroit, Harlan Electric

Company (of that City) followed its established practice of engineering the temporary power system so its installation and maintenance would require a minimum man-hour expenditure. Feeder cables were installed in floor openings made to accommodate bus duct risers. A substantial supply of pre-assembled "temporary power posts" were kept on hand for quick installation at required spots throughout the building area. A mechanic merely strapped the "post" to a building column and connected the leads to the nearest feeder.

Each "post" consists of a wood plank backboard, about 5 feet tall, with a moisture deflector at the top. Under this hood is mounted a 14-circuit circuit-breaker load center with 8, 30ampere, single-pole breakers. Panel leads, long enough to reach the temporary feeders, are coiled ready for connection. Each circuit breaker protects a 3-prong, grounded, "Twistlock" receptacle mounted flush in the sides of the breaker cabinet. Heavy duty extension cords serving power tools are plugged into these outlets. In a few cases, transformers were added to the power posts to supply equipment operating on different voltages.

By using this system, Harlan estimators can establish fairly accurate temporary power installation costs. A three-part breakdown can be made: (1) the pre-assembled "power post"; (2) installing and connecting post; and (3) installation of the temporary feeders. With this unit-cost data at hand, estimates of temporary power costs on other projects can be quickly developed.



PRE-ASSEMBLED POWER POSTS stand ready for immediate installation where needed. Panel under deflecting hood has eight circuit breakers controlling eight arounded receptacles in sides of cabinet.



PORTABLE POST is mounted to building column in a jiffy and panel connected to adjacent feeders. Cord plugged into panel feeds power tool.

Battery Selection For Electric Trucks

INDUSTRIAL

A simple, direct, and time-saving method for determining the size of battery required for any electric industrial truck installation has been developed by the Automatic Transportation Company, Chicago manufacturer of electric-driven industrial trucks. The new system, which reduces by two-thirds the time formerly required to calculate battery needs, uses three simplified charts: one for travel current; one for

Three quality tapes-friction, rubber and plastic.

If the job requires taping -it calls for *ACCURATE*

Make ACCURATE Electrical Tapes your choice for easier taping and positive electrical and mechanical protection. Both friction and rubber, ACCURATE tapes are strong, pliable, easier working. These quality electrical tapes are non-raveling, tear off clean, pull tight and firm ... make neat, high efficiency wraps even over irregular surfaces.

For special jobs where a reduction in bulk is essential, specify ACCURATE plastic electrical tape. Thin caliper, combined with excellent dielectric strength, make it the ideal tape for faster wiring position!



ACCURATE FRICTION TAPE High grade carefully com-

pounded rubber with finest cattan base provides maximum mechanical protection for every wrap. Made in Standard and A.S.T.M.



ACCURATE RUBBER TAPE

Features high elasticity, excellent cohesion, high dielectric and super aging qualities. Available in Standard and A.S.T.M .-A.A.R. grades.



ACCURATE PLASTIC TAPE

Offers a bulk-reducing combination of thin caliper, good mechanical and dielectric strength. Recommended for use wherever plastic tape is practical.



MORE THAN A

YOUR BEST BUY IN TAPE

CENTURY OF TAPE SPECIALIZATION

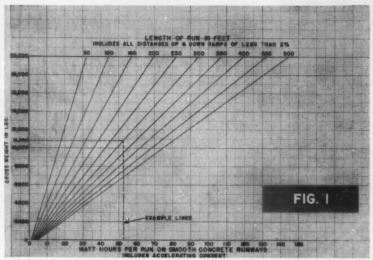


FIG. 1—Travel current is calculated from total weight and one-way length of truck run.

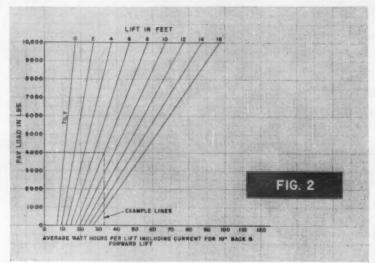


FIG. 2-Lift and tilt current is based on payload on truck and height of lift.

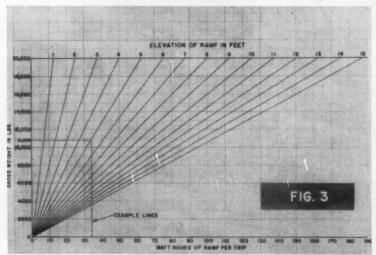


FIG. 3—Ramp current values shown in this chart are for moving trucks on ramps of more than 2% grade,

lift and tilt current; and one for ramp current. These charts can be applied successfully to most electric industrial trucks.

To use the charts, the following factors must be determined first: (1) weight of truck, (2) average weight of load handled, (3) average length of trip one way in feet, including ramps, (4) elevation in feet of any ramps in the trip, (5) number of trips desired per hour, (6) average lifting height, (7) number of lifts per hour, and (8) conditions which might require constant acceleration.

Here's a sample battery calculation:
1. Travel Current

Assume that the truck in question handles a 4,000-pound load 11 times per hour over a one-way average distance of 300 feet. The average lift is 8 feet, and the weight of the truck is 6,800 pounds.

Refer to Travel Current Chart, Fig. 1. Locate 10,800 pounds on the left side of the chart and follow horizontally until it intersects the diagonal 300 feet "distance" line. Read straight down to watthour line. Reading: 52 watthours. Do the same for return trip, using 6,800-pound weight (for empty truck). Watthour reading: 34 watthours. Total round trip Travel Current: 86 watthours.

2. Lift and Tilt Current

See Lift and Tilt Current Chart, Fig. 2. According to our example, 4,000 pounds are lifted an average of 8 feet. Follow along the 4,000-pound line from left of chart to its intersection with the 8-foot diagonal "Lift" line, then directly down to the wattage line. Reading: 33 watthours per lift.

3. Ramb Current

See Ramp Current Chart, Fig. 3. Assume in the exampled trip a ramp with a 5-foot rise has to be climbed each time with loaded truck. At the left of the chart find the weight line (10,800 pounds) and follow it over to the intersection with the 5 foot "elevation or ramp" diagonal, then down to watthour line. Reading: 34 watthours per trip.

From the three charts we know each trip will consume a total of 86 (Travel Current) plus 33 (Lift Current) plus 34 (Ramp Current) watthours, or 153 watthours. Since we are assuming 11 trips per hour, an 8 hour day will mean 88 trips (11 x 8). Thus, in a day's work, the truck will use 153 watthours (total per trip) x 88 (number of trips), or 13,464 watthours. Dividing by 1,000, we get 13.464 kwhr. This, then, would be the minimum size battery that should be selected for the truck in the exampled run.

Standard trucks will not always accommodate the size of battery calculated as a minimum for some extreme duty cycles. If greater capacity is NEW

KEYSTONE

ALUMINUM

Aluminum Overhead Rail System . . .

speeds unleading of ships for the Canton Co., Baltimore. Keystone Aluminum Conductor System powers unloader's 1200-ft, runway, unloading tower rail trolley. Unleading tower hinged through power rails for raising and lowering.

Collectors contact from below. No need for heavy slotted safety enclosures

ELECTRIC SERVICE MANUFACTURING CO.

CONDUCTOR SYSTEM

PROVED 7 WAYS BETTER THAN THE STEEL THIRD RAIL SYSTEM

Here's why it paid the Canton Company of Baltimore to switch from conventional conductors to Keystone Aluminum throughout for their new high-speed ore unloader and 1200-foot-long 2300-volt main runway.



CORROSION REDUCED

Salty dampness doesn't faze the Keystone Aluminum System. Cleaner contact surfaces protected from dirt and damage.



LOW VOLTAGE DROP

The non-magnetic qualities of the Keystone Aluminum System increase current capacity through lower reactance and close conductor spacings.



GREATER CAPACITY

1000 amp rating provides capacity for additional equipment without boosters or multi-point feeds.



SENSITIVE CONTROL

Corrosion resistant Keystone Aluminum Systems assure positive contact on most sensitive control circuits.



DEADWEIGHT SLASHED

Lighter than steel. Needs no heavy supporting structure. Compact 2300-volt runway safely protected with standard enclosure.



LONGER COMPONENT LIFE

Multiple contact collectors prevent arcing and heating. Less vibrating weight saves insulators. Smooth, clean contact surfaces and low current densities mean longer shoe life.



INSTALLATION EASED

Compact design, pre-fabricated, lightweight units mean lower labor and installation costs for either open or closed systems.

Could you use this modern system NOW to obtain efficient operation in your construction or improvement program? Write for complete data today on our Keystone Aluminum Conductor System. Our engineers are ready to help you in either the Keystone Aluminum System or the conventional copper or steel system.

Head-on view of traveling crane: unloading tower in position, control car retracted.

Small insulators made feasible through compact, lightweight aluminum system.

Philadelphia 32, Pa.

Represented in Canada by Lyman Tube and Bearings, Ltd., Montreal and Toronto





The choice of connectors is wide, but there's a big difference when you choose a Dosson. Years of testing under the worst weather and corrosion conditions give undisputed proof of Dosson's permanent grip. Makes quick, simple, efficient connections for solid and stranded conductors in sizes No. 14 to 1000 MCM. High contact pressure between conductors assures maximum security . . . eliminates maintenance. Check these important Dosson features:

- 1) High translation of torque by low coefficient of friction
- 2) High contact pressure
- 3) Free from vibrational loosening
- 4) Withstands high tightening torque
- 5) Maximum contact area
- 6) Made of high strength "DURONZE" alloy
- 7) Better conductivity
- 8) High corrosion resistance
- Economical—usable over and over again
- 10) Dossert precision-manufactured

needed, either the battery compartment must be enlarged or provision made to change batteries more often.

In the example, currents are computed for accelerating the truck only one time in each length of run. If it becomes necessary to figure the current required for six 50-foot runs rather than one continuous 300-foot run, it will be found the truck requires a total of 108 watthours, just double the current for the non-stop run. This should be taken into account in gathering operational information, prior to using the charts for a final minimum battery specification.

Accelerating a truck uses much more current than is realized. If not properly computed, acceleration can result in what appears to be poor battery or truck performance.

To compensate for miscalculations and unknown operating factors, it is advisable to add about 25 per cent of the calculated kwhr power requirement

Electrical Conversion Increases Production In J&L Steel Mill

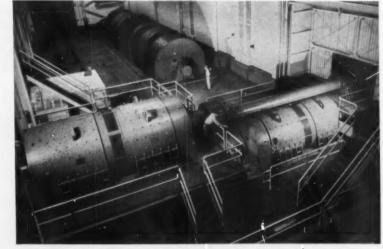
PRODUCTION

Four 3000-hp motors powered by four 3000-kw generators were the principal components in Jones and Laughlin Steel Corporation's recent electrification of a 44-inch blooming mill at their Aliquippa, Pennsylvania, plant. And, in the few months since this 12,000-hp driving unit replaced steam, two new world's ingot records have been established—the most recent record (made January 3rd) being an 8-hour mark of 576 rolled ingots, producing 2534 sheared tons of steel.

The main drive of this champion is powered by two sets of tandem-connected G. E. motors. Motors and generators are enclosed for down-draft ventilation. And operation can be reversed from 70 rpm in one direction to 70 rpm in the opposite direction in less than a second.

To minimize down-time during conversion from steam, all of the electric equipment (including switchgear, m-g sets, ventilation equipment, exciter sets and controls) was completely installed and tested before the steam engine was shut down. Also, in order to assure exact alignment of parts, the entire mill drive was assembled on a temporary foundation outdoors, and all couplings. conduits and related accessory fittings were installed and checked for perfect fitting. Over a hundred tradesmen were also trained in their conversion assignments, and major alterations in the concrete foundations were completed before the change-over took place. Cost of this additional preparation and practice was more than offset by the production which would have been lost if the work had been done in the normal manner for installations of this type.

Armatures of each of the four 3000-hp motors are rated for 70/140-rpm at 750 volts dc.



ELECTRIC DRIVE of 44-inch blooming mill includes two double-armature units (foreground), each unit consisting of two 3000-hp 70/140-rpm 750-volt dc motors. In the background may be seen the flywheel motor generator consisting of four 3000-kw 750-volt dc generators, one 9000-hp 6600-volt 3-phase 60-cycle induction motor, and one 250,000 hp-second flywheel at 360 rpm. In addition to the single-shift record, the blooming mill driven by this electrical installation holds records for a single hour (76 ingots); also for a week and a month. With steam, the best record (also established by this same mill) was 522 ingots per shift—10% less than the present high obtained through electrification.





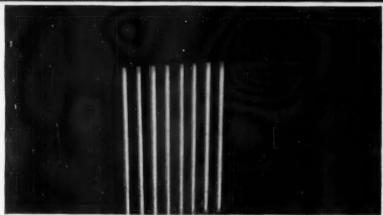
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e.m.t.





NIKOH...the finest name in electrical metallic tubing

Made from highest quality cold-rolled steel. Formed, welded, sized, chamfered, plated, and lacquered by the newest, most modern equipment. Nikoh E.M.T. meets every steel raceway requirement for the protection of electrical conductors. Approved by Underwriters' Laboratories, Inc.

May we supply your E.M.T. needs? Call your Nikoh distributor or sales representative . . . today.



the finest name in E.M.T.

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NIKOH TUBE COMPANY

5000 S. WHIPPLE ST. . CHICAGO 32, ILL. . GROVEHILL 6-6500

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . JUNE, 1954

WIDELY ADAPTABLE

Fluorescent and Slimline Units

00

For cove, cornice or valance lighting ... or supplementary lighting on shelves, counters and display cases, you'll find these Wiremold Units the most useful you've ever worked with. Easily and quickly installed . . . small cross section. Write for full information.

WIREMOLD builds better business for you ... at a profit!

TRIP-PROOF
overfloor power lines with
PANCAKE

Carries power or communication lines over floor to the point of use . . . safely! Strong as a bridge, too — both cover and base are heavy galvanized steel. Two interconnecting sizes meet all requirements. Write today for the PANCAKE booklet.

WIREMOLD products are backed by a firm guarantee. See page 7 of Wiremold Catalog No. 19.

The WIREMOLD Company
HARTFORD 10, CONNECTICUT



Electric Hoist Speeds Battery Recharging

MAINTENANCI

In-plant materials handling at Contental Can's Pittsburgh plant is greatly speeded and facilitated through the use of dozens of hefty battery-operated industrial trucks and fork lifts. Therefore these trucks are important keys to production and they are kept in constant peak operating condition by routine maintenance inspections, lubrication, replacement of worn parts and a modern battery recharging station.

Here an overhead monorail and a remotely-controlled electric hoist are used to lift the king-sized batteries from their cradles on the trucks and swing them to the recharging rack. Then, since several extra batteries are kept in reserve, a recharged unit can be immediately substituted, thereby eliminating all down-time which otherwise would be necessary for this operation.



HEATING CABLE is shown here being installed in the steps of the Suburban Philadelphia Station of the Pennsylvania Railroad. The electric cable will keep these steps free of snow and ice, eliminating the usual hazards and inconvenience to station traffic. The heating circuit can quickly and simply be switched on to melt any accumulation and to prevent formation of ice.

Architects—Holabird & Root & Burgee
Lighting Fixtures—Morris Kurtzon, Inc.
Electrical Contractors—Kelso-Burnett Electric Co., Inc.
Lightingware—Corning Fota-Lite



How modern offices can use Corning Fota-Lite to advantage

The rich setting of these new offices of a large oil company show how CORNING Fota-Lite is used best. Notice how evenly it distributes light.

Fota-Lite is richly rewarding to work with. It gives you all of the lighting advantages of louvered lighting plus the advantages of flat glass—easy cleaning.

Fota-Lite provides high levels of illumination with low brightness. The soft opal louvers afford diffusion at normal viewing angles. Vertical light, however, is unrestricted.

Fota-Lite is not color selective. You can use it freely for wonderful effects where colors form a mood or where color encourages a buying decision.

What is Fota-Lite?

It's fine crystal glass in which tiny opal louvers are created by a photographic process. Strong, lightweight, free of warpage, Fota-Lite encloses light sources with a minimum of bulk. You can use it for an entire luminous ceiling or for keying interest to relatively small areas. Fota-Lite offers rare value when it comes to beautiful lighting and lighting that is efficient. And the smooth glass surface permits easier cleaning.

You can get complete information about Fota-Lite and other Corning products just by signing and mailing the request slip below. We'll send you a free copy of Architects and Engineering Handbook of Lighting Glassware.

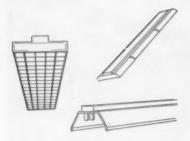


CORNING GLASS WORKS CORNING, N. Y.

Corning means research in Glass

Please send me a copy	of the "Architects and Engineers Handbook of Lighting
Glassware."	The state of the s
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Company	
Address	
City.	Zone State

Data Sheet



Fixture Selection Guide

A most important step in any lighting job is selecting the particular fixture to be installed. Units of similar appearance may differ radically in installation and operation costs as well as in performance. Since the efficiency of the lighting system is a prime basis for judging the engineer's and the contractor's work, careful consideration should be given to the choice of the fixture to be used.

Every man doing lighting design has ample material available to help him pick the *type* of equipment to use, but there has been no impartial guide to aid him in choosing the specific fixture that will do the best job. This check list will meet that need.

By applying the following questions to the various fixtures under consideration, a good idea of their relative merits may be obtained.



Photometric Characteristics

A. Does the fixture efficiency and distribution provide the optimum quantity and quality of illumination?

B. Is the degree of shielding adequate to properly control the fixture brightness for the intended application?



Electrical Performance

A. Are ballasts of high power factor?

B. In starter-type fixtures, are the ballasts brick-type for quieter, cooler operation . . . and compensated to assure longer lamp life?

C. Do starters and ballasts meet established industry standards, guaranteeing best possible service?

D. Are fixtures adequately ventilated to assure maximum operational life of all components?

E. Are lampholders well constructed, providing positive contact with lamp terminals and avoiding breakage during installation and maintenance?



Installation Features

A. Does the fixture as furnished by the manufacturer require a minimum of on-the-job assembly?

B. Does the small number of required accessories permit labor savings in handling and installation?

C. Are double-length channels available, as well as single lengths, to decrease installation time and material?



Material Specifications

A. Is the structural body of the fixture fabricated from a minimum of 20 gage cold-rolled steel, insuring a rigid installation that resists vibration and sway?

B. Are fixtures designed for versatility of mounting methods to permit single- or twin-stem hangers and either individual or continuous row installation?

C. Are all reflecting surfaces finished with materials that provide optimum balance of hardness, cohesion, adhesion, and continued high reflectance?

D. Are all painted metal parts treated to insure a positive paint bond and a corrosion-resistant base coating?



Maintenance Procedures

A. Is the louver hinged (or double hinged) to simplify lamp replacement and cleaning?

B. Are lamps accessible without use of tools?

C. Is the ballast mounted in such a manner that it may be replaced without dismounting the fixture, whether it is pendant or surface mounted?



Guarantee

A. Does the manufacturer supply a written guarantee covering all components of the fixture? How long is the unit guaranteed?

B. Do you know the manufacturer?



With Allis-Chalmers Type H Starters, your motors, cables and associated equipment are protected against short circuits by fast-acting current limiting fuses. These fuses cut off short circuit current at a low safe peak value. The short is cleared in less than a half cycle . . . thus minimizing the possibility of damage.

Noiseless, Safe, Positive

Action is silent. An indicator in the end of fuse reveals occurrence of short. Blown fuse emits no gas, flame nor vapor . . . discharges no metal. Flashover caused by ionized vapor is eliminated. Fuses will not blow unnecessarily . . . protection against locked-rotor or single-phase conditions is provided by overload relays coordinated with fuses.

The FULL Protection Starter

Quick action short circuit protection is a part of the *Full Protection* engineered into a Type H starter . . . complete, positive protection which permits men to work in safety, guards motors and machines against costly damage, lengthens equipment life, increases production by reducing down time. Get all the facts from your nearby A-C representative or write Allis-Chalmers, Milwaukee 1. Wisconsin.

Compare 80,000 amperes -100% vailable in system obtained with would be passed ordinary fuse by ordinary fuse 20.000-ampere Allowed by et-through curren current with current limiting fuse limiting fuse -6%

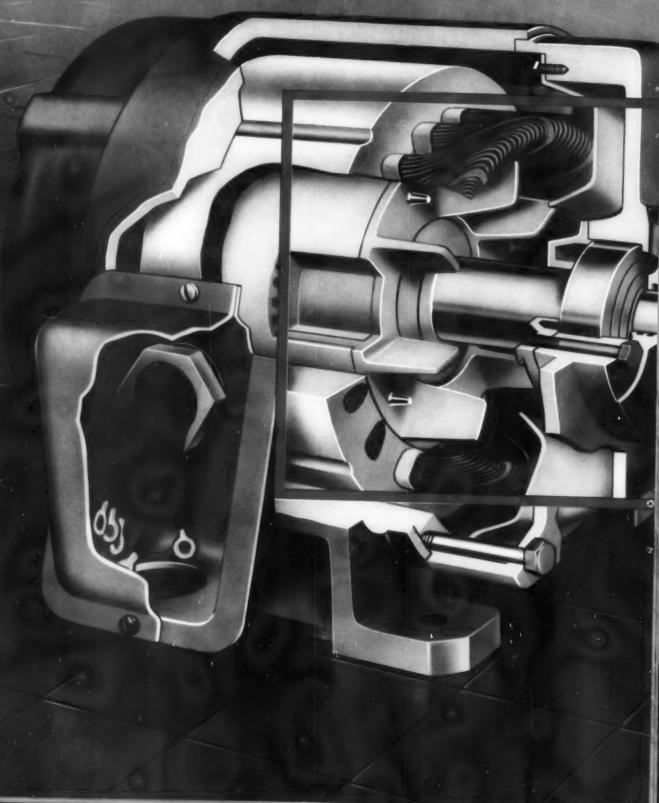
Current Limiting Effect



ALLIS-CHALMERS

Force on Conductors

Get Greater with New Features

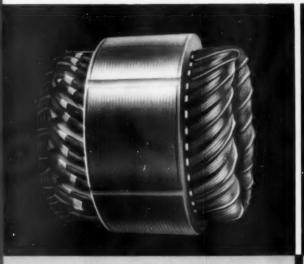


Motor Economy ... Proved Principles

Here's the inside story of a great new motor. It combines the best of the new developments in methods and materials with the best of the tried and proved principles that have made such an outstanding record for Allis-Chalmers motors.

Smaller in size than previous designs, it offers greater protection against damage from falling liquids and solids. The bearing design gives greater bearing protection, ease of maintenance and long life. Insulation gives you famous Allis-Chalmers rugged dependability.

Consult your nearby Allis-Chalmers Authorized Distributor or District Office on your motor needs. Or write for Bulletin 51B6210.



STATOR DOUBLE INSULATED —Stator luminations are welded across back for rigidity. Heavy varnished cambric insulation is inserted between phase windings. Wound stator is dipped several times in special insulating varnish of proved effectiveness and stamina, and baked after each dip. The Allis-Chalmers stator is both physically and electrically strong . . . thoroughly protected against moisture, heat and corrosson.



RIGID CAST-IRON FRAME—Heavy, distortion-free castiren frame holds bearings in rigid alignment . . . gives alicround protection against physical damage . . . resists rusting.

Air intakes are well protected by being located on the underside of the end housing. There is plenty of room for free air circulation on the back of the stator core for efficient, even cooling. Air is discharged horizontally and to the sides.

Multiple bearing protection keeps grease in ... keeps dirt out ... permits relubrication in service

Extreme care has been taken to provide longest possible bearing life and lowest possible maintenance costs. The bearing itself is of double-shielded type, which allows controlled migration of grease in and out of the bearing to suit operating conditions. Yet bearing is protected against greatest cause of bearing trouble — overgreasing.

Close running clearances and double labyrinth seals be-

tween the shaft and outer bearing housings keep grease in the bearing and exclude dirt. Grease is kept out of the interior of the motor by a bearing cap with a long running clearance along the shaft. The cap is held tightly in place

by hex head cap screws. Large grease chambers hold an ample supply of lubricant.



ALLIS-CHALMERS



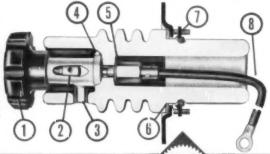
Turn the clamping knob on Allis-Chalmers new high voltage sidewall bushings to complete installation connections. It grips two standard conductors as large as No. 2 stranded cable at the same time. It eliminates splicing. Connections can be made from either side of the bushing quickly, without tools. Careful engineering provides complete protection against live parts,

The new sidewall bushing is supplied on Allis-Chalmers distribution transformers 167 kva and smaller, 5 kv and below. Get complete facts from your nearby Allis-Chalmers authorized dealer or district office, or write Allis-Chalmers Manufacturing Company, Milwaukee 1, Wisconsin.



FEATURES

- Large molded phenolic clamping knob with finger-grips facilitates turning. It will not fall off, even when completely backed-off. Knob collar keeps fingers away from live
- 2 Convex surfaced ram, actuated by knob, forces wires against the concave surface of connector body. This snubbing action locks the cable in the connector. All parts are tinned.
- Integral bushing electrode sim-plifies lightning arrester installa-ation on transformers. Gap from bushing to lightning arrester ter-ninal removes electrical stress from the arrester except when flashover
- Connector is keyed to porcelain preventing rotation, thus pro-tecting the gasket against twist or shear. Gasket prevents oil leakage.
- 5 Fibre gasket provides mechanical cushion between metal parts and porcelain.
- 6 Bushing is sealed in tank wall with corprene gasket. Recessed seat retains gasket for effective seal.
- 7 Internal clamping ring keeps bushing locked securely in place. Bolts exert even pressure on tank wall to produce uniform gasket compression. Internal ring helps simplify external maintenance.
- 8 Bushing cable terminates at terminal board. Easy removal simplifies routine maintenance



ALLIS-CHALM

Motor Shops



CORRODED TUBES are removed with a burning torch and new tubes are welded to the casing in their stead. Other corroded areas are built up by metalizing or by welding an additional plate over the thin or pitted sections.

Transformer Tanks Reconditioned

The Belyea Company of Jersey City, N. J., has devoted an entire department to the reconditioning of transformer tanks for the local utility company, and operations are logically carried out in a progressive step-by-step arrangement that eliminates much waste motion, minimizes distances between related operations, precludes the omission of details and insures an excellent job being performed.

Since tanks frequently are located in manholes, vaults or similar locations where water and condensation are present, the reconditioning procedure pays special attention to corrosion. Damaged components of the tanks are replaced, thin or pitted sections are built up by metalizing or brazing, and

the entire assembly is coated with several layers of bithulithic compound through a flow-painting process as a final step.

No attempt is made to build up corroded metal of external circulating coils, these being cut off and replaced by entirely new tubes. Tanks are lifted by woven-wire slings and a 2-ton chain hoist and then are placed on low angle iron A-frame horses, where they are at a convenient height for the worker who cuts out the damaged tubes with an acetylene torch. New tubes are then welded into position and the remainder of the reconditioning cycle continues.

Shop-Made Dynamic Balancer

A special, shop-made dynamic balancer has been found highly effective for balancing a wide range of armatures in the motor shop of the New Orleans Armature Works, New Orleans, La. Powered by a variable speed drive, the unit has proved fast and accurate in operation.

As shown in Fig. 1, the rig consists of a number of interrelated elements. In the foreground are the two upright members between which an armature under test is cradled. These uprights are mounted on blocks which ride along guide pipes, allowing free and wide range adjustment of the distance between the uprights, so varying armature lengths can be accommodated.

A special arrangement for holding the armature shaft is mounted on each upright. Each of these elements consists of a steel cradle which supports two rollers, one on each side of the base of a V-shaped cut in the cradle—all mounted on a vertical rod which passes down through and is anchored securely in the base of the upright member. The tension of each vertical rod can be adjusted by varying the height of a movable support which can provide a second firm hold on the rod, anywhere along its length.

In use, when the tension of the vertical cradle rods has been set to provide proper test conditions for a particular weight of armature and speed of rotation, the dial-reading vibration indicators shown on the left side of



FIG. 1—Cradle uprights for supporting armatures on the balancer ride on pipe guides.

each cradle are moved in against the cradles. These indicators are sensitive to one-thousandth of an inch and will reveal the slightest vibration of the cradles due to armature unbalance.

Rotation of the armature is accomplished by belt drive from a pulley on a rotating shaft which runs between the pipe rails which guide movement of the upright stands. A laced belt is put around the pulley (hidden by upright in Fig. 1) and the armature. The length of the belt is adjusted for armature diameter by adding or taking out sections. The handle which can just be seen between the upright stands is part of an arrangement for taking slack out of the belt after it has been placed in position over the armature and pulley. By moving the handle up, a free-wheeling pulley is pressed



SLING AND HOIST are used to lift transformer tank onto low angle-iron horses prior to removal of damaged circulating tubes from exterior of enclosure.

NEW Century

Performance-Rated®





Now available in 1...1½...2 H.P. sizes— NEMA frames 182 and 184.

to match your needs

SMALLER - LIGHTER

More uniform silicon-laminated steel; thinner, tougher "Mylar" slot insulation — just two of the many technical developments that help make these new Century Performance Rated Motors so much smaller and lighter.

BETTER PROTECTION

New concepts of internal motor ventilation permit end bracket and frame design that gives far better protection from falling liquids and solids...still maintain 40°C. temperature rise.

MORE FLEXIBLE MOUNTING

You can even have cushion mounting with these new Century Integral H.P. Motors — your choice of sleeve or ball bearings. Ball bearing motors mount vertically, upside down, in any position. End brackets can be rotated for top protection in any position.

EVEN MORE DEPENDABILITY

Improved plastic impregnating varnish and plastic insulated magnet wire provide unusual resistance to abrasion, moisture and heat. These new materials possess far better dielectric qualities. Die cast aluminum rotors are individually, dynamically balanced to assure freedom from vibration.



Offices and Stock Points in Principal Cities

Specify CENTURY Performance Rated motors for your equipment. Call a Century District Sales Office or your nearest Century Authorized Distributor.

CENTURY ELECTRIC COMPANY • 1806 Pine Street • St. Louis 3, Missouri

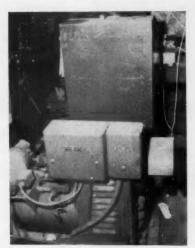


FIG. 2—Varidrive motor, with speed control motor at left, is installed alongside the control cabinet (rear).

against the inside of the belt, taking up the slack without further loading the drive pulley.

The shaft on which the drive pulley is mounted is coupled by belt and pulley to the variable-speed drive motor. This coupling is made in the bottom of the control cabinet, shown behind uprights in Fig. 1.

A 440-volt, 3-phase Varidrive induction motor with variable output rpm is used. Regulation of drive speed is made by another, small 440-volt 3phase motor which is geared to actuate the internal speed-variation mechanism in the Varidrive motor. regulating motor is controlled through a magnetic reversing switch from the panel on the control cabinet. pushbuttons on the panel allow reversible phasing of excitation to the control motor. Forward and reverse rotation of the control motor correspond to increase and decrease of Varidrive speed. These pushbuttons must be held closed for duration of speed change. As long as one of the buttons is held, speed is increasing or decreasing. As soon as a button is released, the control motor stops and the speed of the Varidrive output remains fixed at the particular Fig. 2 shows the Varidrive valve motor with controls on top, speed control motor at left, pulley guard at right and control cabinet immediately behind.

Adjustable Stand Holds Large Armatures Erect

Motor armatures ranging from 10-hp to 40-hp. size are held in a stable erect position for specific repair operations at the Wm. C. Krauth Electric Company in Louisville, Kentucky. One heavy stand takes the full size range and permits the armature to be

rotated while the mechanic works on

The former method of suspending the rotor from an overhead hoist or crane was not entirely satisfactory. The unit was seldom in a perpendicular plane, had a tendency to swing, and was difficult to rotate through small arcs. Shop personnel worried along with it until the new armature stand was built.

An idea for an armature stand had lingered for some time in the mind of shop operator Krauth. Always present were the obstacles of size, weight and floor space needed for a unit that would take the big jobs. That is, until Krauth ran his experienced eye over an obsolete engine-driven direct current generator one day. His attention focused on a heavy cast spider in the unit and the rotor stand became a reality.

The 700-pound spider has a 31-inch spread at the base, an 8½-in. diameter well that is 20 inches high—a combination of sufficient weight and mass to be a "natural" stand for large armatures. With this as a starter, Krauth ingenuity came into play. Adjustable features such as a base center post and



HEAVY SPIDER base forms natural stand to hold armatures in upright position. Adjustable fiber jaws at top securely center rotor shaft without binding.



SCORE LINES on radially adjustable centering-jaws simplify perpendicular alignment of rotor in stand. Numbered marks line-up with notch on alignment pins. Rotor shaft rests on center post in raised base of casting well.



ARMATURE is lowered into well of stand. Mechanic at left makes certain shaft rests on pre-set center post in base before adjusting sliding jaws.



JAWS ARE LOCKED in place, by turning sturdy bolt, after being properly positioned according to score marks to assure vertical alignment of armature.

alignment jaws were added to accommodate a variety of armature shaft diameters and lengths. Lifting bolts on a chain loop permit the stand to be moved anywhere on the shop floor.

A heavy steel plate encloses the well some four inches above floor level. Directly under an opening in the plate, and welded to the underside, is a heavy threaded coupling into which the center post (1½-in. diameter) fits. This screw centers and supports the armature shaft, being raised or lowered to meet different shaft dimensions. Two posts, one long and one short, are normally used with the base.

Once the armature shaft rests on the center post the rotor is kept in upright position by a set of four fiber "jaws" at the top of the casting. Each jaw is 9-in. long, 2\frac{1}{4}-in. wide, \frac{1}{4}-in. thick; has a 6\frac{1}{2}-in. long slot (1-in. wide) through which a flush alignment pin and locking bolt protrude. Each jaw can slide in or out radially

How to win a bid without sacrificing profit

Next time a customer says, "Tough luck but we gave the job to your competitor," remember—there is more than one way to be competitive without cutting your profit.

New Rome FlexAll may be the answer.

FlexAll fits more jobs. You don't have to lug around wires for different applications because FlexAll is a multiple purpose non-metallic sheathed product. On-the-job time and costs are cut. Cash tied up in inventory is less. FlexAll solves a lot of other problems, too. For example:

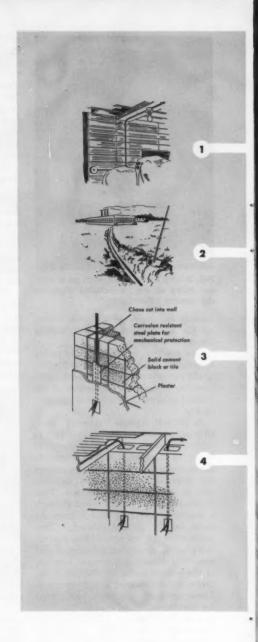
Single-Conductor FlexAll

- 1 It has Underwriters' Laboratory approval as Type UF (Underground Feeder).
- 2 It is recognized by the National Electrical Code (1953) for installation in branch or feeder circuits buried directly in the earth, when provided with overcurrent protection.
- 3 The integrally applied Rome Synthinol, Type TW, thermoplastic insulation and sheath are resistant to wet and corrosive conditions.
- 4 It's manufactured in sizes 14 AWG through 4 AWG standard color, black-packaged in 500-ft. coils-600 volts.

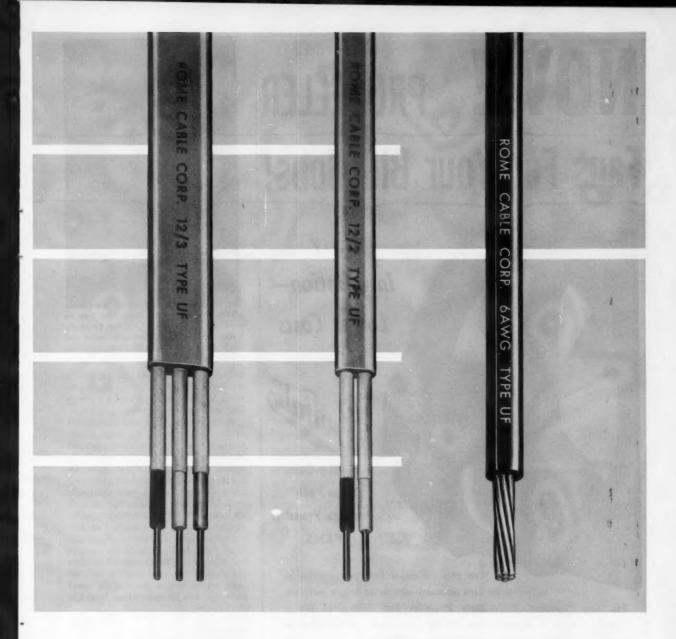
Two- and Three-Conductor FlexAll

- 1 It has UL approval as both Type UF and Type NMC (Non-metallic Sheathed Cable—Corrosive Resistant).
- 2 It has National Electrical Code (1953) recognition for:
- 1 branch or feeder circuits buried direct in earth, with proper overcurrent protection.
- 2 interior wiring, either exposed or concealed, in corrosive, wet or dry locations.
- 3 installation within hollow spaces of outside or inside masonry block or tile walls.
- embedding in plaster or shallow chase in masonry, when suitably protected.
- 3 The high-quality insulation is Rome Synthinol. Individual conductors are covered with an inorganic glass yarn wrap. Over the assembled conductors there's a Rome Synthinol sheath. Rome Synthinol is flame, rot, abrasion and moisture resistant for safe installation under wet or corrosive conditions.
- 4 It is manufactured in sizes 14 AWG through 10 AWG-standard color, pearl gray-in cartons of 250 ft.-600 volts.

Add all these features together—and you are in a better position to land the next job . . . without sacrifice to profit.







Another Rome first...

New Glass Covered Triple Knit Weatherproof Wire

2 inside coverings of cotton and an OUTER COVER OF GLASS YARN

There are 4 big installation advantages in Rome's Fiberglas covered contractor's weatherproof . . .

- Resistance to Weathering—Fiberglas has inherent resistance to weathering. Even if in time the asphalt saturant and finisher deteriorate, the glass outer cover holds the inner cotton layers intact and prevents unsightly festooning.
- 2 Moisture Resistance—Individually, glass fibers resist moisture absorption—glass yarns are solid rods or filaments, consequently, water cannot penetrate the inner structure of the yarn. Coated with asphaltic compound, glass yarn attains extremely high resistance to moisture.

- 3 Tensile Strength—Inorganic glass yarn has a tensile strength several times that of comparable organic fibers and retains it indefinitely.
- 4 Chemical Resistance—Glass fibers are not affected by oils and are resistant to most acids—they are an especially durable support for asphalt coatings.

The permanency of glass, YOURS now on Rome Triple Knit Weatherproof—sizes 14 AWG through 4 AWG—in special wholesaler's package of 500 feet.

It Costs Less to Buy the Best



NOW! PROPELLER Fans For Your BIG Jobs!



The new "Buffalo" Heavy-Duty Propeller Fan line gives you a capacity range from 4,000 to 150,000 cfm—and performance is excellent against as high as 1" pressure. Think of it—you can ventilate warehouses, factories, other really large areas with these husky, easily serviced fans. Special models for high temperature and/or corrosive fume applications. Write today for literature on this biggest line of fine propeller fans, both direct drive and V belt drive, ever offered by "Buffalo"!



PANEL BREEZO FANS BREEZ-AIR ATTIC FANS

BUFFALO FORGE COMPANY

520 Broadway Buffalo, New York PUBLISHERS OF "FAN ENGINEERING" HANDBOOK Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

BELTED VENT SETS

BELT-AIR FANS



BOTH HANDS of mechanic are free to work on upright rotor. Unit can be easily turned in stand so mechanic need not circle around armature to check complete commutator.

for different diameter shafts, has a shallow-V shaped tip to hug shaft contours, and is locked in place by a sturdy bolt and washer assembly.

Perpendicular alignment of rotors is assured by a system of score marks across the face of the movable jaws and stationary pins. Twelve such marks spaced on each jaw at 1-in. intervals are numbered (on one edge) in inverse order (from 12 to 1) from the tip to back. Marks on the jaws line up with the notch on the alignment pin, eliminating trial-and-error method of perpendicular rotor alignment. Example: With rotor held perpendicular, one of the jaws is moved in until it touches the shaft. If this is position "6", all jaws are locked in position "6", and their tips will be equidistant from the shaft center.

The four jaws can be adjusted for shaft diameters ranging from 1½ to 6 in. and are locked in position without binding the rotor. This permits the mechanic to slowly turn the unit when inspecting or preparing it.

Krauth shop personnel like the new armature stand. While set-up time is understandably greater than for simple hoist suspension, full freedom of both hands to work on the rotor substantially reduces overall repair time.

Inventory Procedures Greatly Simplified

Anyone who can count can take an inventory at Queens Electric Motors, New York. They don't have to know the names or purposes of the parts



TELEPHONE SWITCHBOARDS



FIRETOWERS AND CORRIDORS



DISPENSARIES



CONTROLS

NOW! Hundreds of profit-making spots for you to sell new **Exide** LIGHTGUARDS[®]!

Wherever people gather, there's need for Exide Lightguard protection . . . in stores, restaurants, theaters, hotels, churches, banks, office buildings, police stations, schools. Some industrial plants use as many as 200. The following spots need dependable, emergency lighting protection: sales floors, cashier's cages, open counter displays, corridors, aisles, dining rooms, lobbies, boiler rooms, engine rooms, switchboard rooms, loading platforms, vaults, exits, firetowers. They are all spots where you can profit by selling Exide Lightguard units.

The new Exide Lightguard unit lights up instantly and automatically whenever the normal electrical supply is interrupted by storms, floods, accidents, fires or other causes beyond the control of the ever-vigilant utility companies. When lights go out, Lightguards go on. They safeguard customers and employees against injuries; they minimize property damage, pilferage, and enable control of vital processes to be maintained.

WRITE NOW FOR FULL DETAILS

Let's see how the new Model M Exide Lightguard gives you big sales advantages. The Model M has a two-rate charger—high rate or trickle. After the emergency, the high rate charger restores the Exide battery which was specially built for emergency lighting use. This Exide

battery assures dependable, troublefree operation, long life, easy maintenance. All Exide Lightguards are UL-approved and can be plugged into any 115 volt outlet. They operate instantly—each lamp illuminating up to 10,000 sq. ft. There is up to 8 hours of continuous emergency lighting protection in the standard one-lamp unit!

If you are an electrical contractor or electrical equipment dealer, cash in today on an expanding market by selling new Model M Exide Lightguards. Get all the facts now. Sell the best available unit—one that will keep your customers satisfied. Fill out the coupon and send it to us today!



Exide	INDUSTRIAL DIVISI	ON	
	orage Battery Company		
Philadelphia :	Pa.		
SureI wan		ting. Rush details on the new Ex	ide
Name			
Address	*********		
		State	
City	********		********

Porcelain Products' service mast KIT

Everything furnished



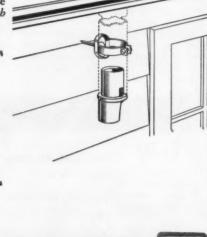
Available Now!—a Service Entrance Mast kit complete to every detail—including roof flashing. Even necessary bolts, nuts, lag screws, and nails. These articles make up the new Porcelain Products' service mast kit that you'll put up and forget. All components of the kit can be installed by an electrician, with electricians' tools.

Here is a list of the parts:

- $\sqrt{11/4}^{\prime\prime}$ UL approved Service Entrance Cay $\sqrt{11/4}^{\prime\prime}$ to 2" Bell Reducer to adapt
- service cap to conduit

 √ Galvanized Roof Flashing and Storm
 Collar
- √ Roof Mounting Plate of new and original design
- √ Conduit hanger with 2½" lag screw attached
- √ Slip-fitting offset reducer with interior grounding device
- √ All necessary bolts, nuts, lag screws and nails
- √ Plus—Percelain Products famous 2061-C Pipe Mounting house brackets as specified.

Write for details today!





PURCHASING AGENT has each item in stock listed on a rotary card index. Cards are grouped into classifications of parts (such as bearings, brushes, switches), then filed in numerical sequence by bin serial number. This facilitates prompt checking procedures.



MINIMUM INVENTORY number is plainly posted on side of each storage bin and purchasing agent is notified to reorder particular parts only when the stock drops below the indicated safe supply mark. Serial number of each bin is contained on label on front lip.

they are looking at, and they don't have to interpret the numbers after they have jotted them down. Because of this, there is no special training required and anyone can perform this job quickly and accurately.

Here is how the system works. Brushes, springs, contacts, bearings and the like are stored either in bins or in drawers. On the lip of each bin or drawer is an item serial number, and on the side of the bin or drawer is another number that represents a safe minimum inventory. Wherever there are more parts in a bin than the inventory number, the supply is ample for the time being and need not be re-





switch capacities PULFUZSWITCH - 30 to 100 amps 250 volts and 30 and 60 amps, 600 volts. KLAMPSWITCHFUZ - 30 to 200 amps, 250 volts AC or SNUFARC - 30 to 200 amps, 600 volts AC, 2, 3 and 4 poles. DC.

Main Capacities - 250, 400 and 500 amps, 250 or 600 volts in sik basic assemblies.

> Above illustration shows "On the Job" assembly of combing-tion Klampswitchfux and Pulfuxswitch Panelboard.



Feeder Distribution NELBOARDS

Pulfuzswitch, Klampswitchfuz and Snufarc feeder distribution panelboards are now available on the "panel base assembly" plan, which means that you can order these popular panelboards right out of stock for quick and easy assembly on the job.

All components of each type of panel — box, front, panel back, main bus bars and lug connections, neutral bar and 21/4 inch adjustable cover — are compactly packaged and are being stocked by (6) distributors for the convenience of contractors, engineers and others. Switch units are separately packaged also.

Approved by the Underwriters' Laboratories, Inc., for label service, these panelboards are the finest in safety and efficiency. All switch units are of the operating type and horsepower-rated. They combine switch and fuse in one unit so that the current is "Off" when fuses are accessible. For maximum efficiency, all current-carrying switch and fuse contacts are heavily silver-plated and fuseholders clamp under pressure.

The next time you need a feeder distribution panelboard, ask for .

Frank Adam Electric Co.

P. O. BOX 357 • ST. LOUIS 3, MISSOURI

· For further information. see your @ distributor or consult a @ representative listed

in Sweet's Industrial Construction, and Plant Engineering file.



Makers of: BUSDUCT . PANELBOARDS . SWITCHBOARDS . SERVICE EQUIPMENT . SAFETY SWITCHES . LOAD CENTERS . QUIKHETER

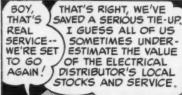














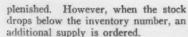
"Remember in emergencies or for everyday electrical needs, it pays to call your local T & B distributor — he saves and serves by simplifying your purchasing problems and reducing your costs."

In keeping with our policy of selling solely through Electrical Wholesalers, we are pleased to sponsor the above message on behalf of T&B distributors throughout the nation.

THE THOMAS & BETTS CO.

INCORPORATED

Elizabeth • New Jersey
The Thomas & Betts Co., Ud., Montreal P.Q., Canada
MANUFACTURERS OF FINE ELECTRICAL FITTINGS SINCE 1898



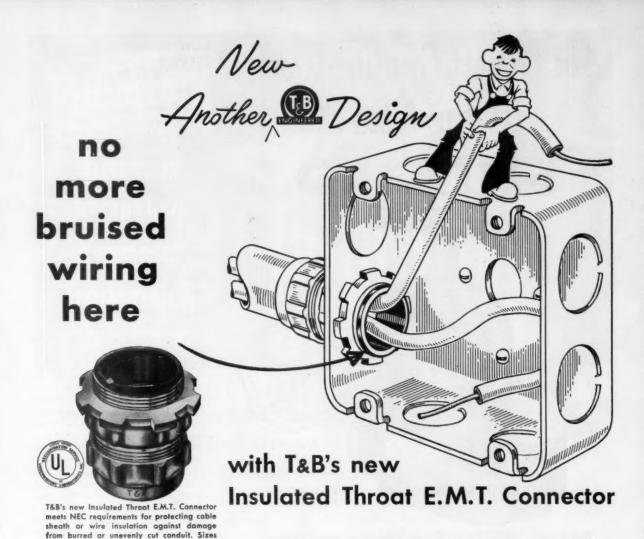
With this minimum inventory number plainly in view, the adequacy of the supply can be roughly estimated every time a part is withdrawn from stock, but an exact count is taken each month as a double check. To do this, the checker is given a mimeographed sheet listing each item serial number in sequence. All the checker has to do is count the number of items in each bin and, if it is less than the minimum inventory number posted on the side of the bin, he just checks the space on his sheet. This requires little thought, little paper work and little time.

When finished, he passes the checklist over to the purchasing agent who has a Wheeldex card index for each item, arranged in sequence by serial number. These cards contain full information on each item, listing not only the shop's serial number, but the manufacturer's catalog number as well, the name of the part, the bin number and location in which it is stored, the supplier's name, address and telephone number, and the quantity of parts to reorder to replenish the supply. When the inventory moves faster in one season than in another, this is also noted in boxes on the card labeled 'winter-summer-max-min".

Cards on the Wheeldex rack are grouped in accordance with part names; that is, all cards relating to magnet wire, switches, bearings, and the like, are located together. Each group is plainly tabbed for fast reference. In addition, colored clips may be fastened to the card edges to indicate what parts are in low supply, what parts are on order and what orders should be rushed. The date of the order is likewise noted here.

As soon as the reordered parts are received, the clips are removed, the quantity of parts recorded, and the price per item is recorded. This may be done rapidly by dividing the cost of the order by the number of parts in the order. It may be done on a slide rule for added speed, for the price need only be a close approximation to check on former prices and to serve as a billing standard. By noting these unit-prices, errors in the manufacturers' bills are detected instantly and, if the cost of certain items is actually substantially higher than previous orders, corresponding adjustments in shop quotations for typical jobs may be arranged in order to maintain a legitimate profit.

This well organized system offers three advantages: (1) it provides simple and precise inventory control; (2) accuracy is maintained without use of grade A labor; and (3) suppliers' bills are easily checked.



A bright blue, factory-inserted insulating liner completely covers the area inside the connector throat and provides a rounded, burr-free passage for wiring. The liner is extremely tough with a smooth, resilient surface... unaffected by common acids, solvents, moisture, and fumes. A lip protrudes slightly beyond the connector body forming a tell-tale bright blue ring—similar to ther T&B "blue" fittings—visual assurance for an inspector that the connection is insulated.

1/2 to 2 inches.

There's no other fitting comparable to T&B's new Insulated Throat E.M.T. Connector! No separate insulating bushing needed. Installs just like a conventional connector. Same wrench size fits both body and gland hexes.

And it's up to 50% longer than conventional connectors! The extra-deep body provides a much greater area of firm, rigid support for the tubing. Conduit has to line up properly. Runs are straighter. Steel body, gland, ring and locknut are your assurance of uniform strength and dimensional accuracy. A free sample and descriptive literature will be sent to you with no obligation. Write to T&B today.

LOOK FOR THIS SIGN -



IT'S THE MARK OF AN AUTHORIZED T & B DISTRIBUTOR

The complete line of T & B fittings for conductors and raceways is sold only by recognized electrical wholesalers. It's our way of assuring you the service and savings of a friendly local source. Call him for all your electrical needs.

THE THOMAS & BETTS CO.

INCORPORATED

34 Butler Street • Elizabeth 1, New Jersey
Thomas & Betts Ltd., Montreal, P.Q., Canada
MANUFACTURERS OF FINE ELECTRICAL FITTINGS SINCE 1898

For Easiest Conduit Work ... it's the New 20



More utility for your money in RIDGID Bench Vises

No wonder this bench yoke vise is popular everywhere! You can make the yoke open for either right or left hand. It has an integral conduit rest for easier cutting or threading... new built-in conduit bender... strong special malleable yoke and base... LonGrip jaws of top quality toolsteel. You simply can't beat it for efficient easy operation that lasts for years! Buy it at your Supply House.

Same work-saver features in RIBID post, kit and stand yoke vises and bench, post and stand chain vises.

See us at Western Plant Maintenance Show, Booths 639, 643.

THE RIDGE TOOL COMPANY . ELYRIA, OHIO, U. S. A.



CONVERSION FOR

[FROM PAGE 83]

All lighting switches are 125-volt 20-amp T-rated units; mounted at a height of 41-feet above floor levels and, where they are located adjacent to door jambs in hollow steel partitions, the control wiring is carried upwards inside the partitions themselves, then carried above the false ceiling to connect with the circuits they control. This partition-routing method for wiring also applies to partition-mounted receptacles, for these connections likewise extend upwards to circuit junction boxes located in the space between suspended ceiling panels and overhead floor slabs.

Silk Purse from Sow's Ear

The total floor area converted was 52,000 square feet (4000 of which is occupied by air conditioning equipment). It provides space for 350 employees, is centrally located to all transportation lines, stores, restaurants and amusement centers; is conveniently adjacent to Sohio's main headquarters, connected by wide doorways cut in the intervening building walls—and it permits the efficient handling of a multiplicity of accounting operations related to Sohio's 9-year growth from a 125-into a 321-million-dollar business giant.

For the economic minded, the three major installation costs were those associated with (1) lighting and related wiring (2) acoustical ceiling with framing and suspension, and (3) flooring, with leveling and adhesion. Respectively, on a square-foot basis, these items amounted to \$1.00, \$.75 and \$.70. And, by combining lighting troffers and ceiling panels in the same plane, it was possible to (1) provide unusually fine illumination, (2) reduce the number of ceiling tiles required, (3) minimize the noise level, (4) hide unsightly structural beams and (5) provide a logical space for all ducts and wiring.

In their \$312-million decade-long modernization and expansion program, Sohio can point with justifiable pride to new refineries and pumping stations, oil barges, production facilities and highway service stations, yet high on their list should go this garage-to-office conversion job, for it represents a high order of planning, design and execution ability. It is a constructive solution for Cleveland's critical down-town office-space problem and it is also an outstanding example of planned electrical modernization.

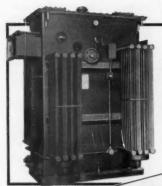


Now, Wagner Noflamol (non-inflammable liquid-filled) Load Center Transformers are available in a new, improved close-coupled design, as well as in the standard throat-con-

nected design. These transformers can be flush-mounted with any make of switchgear to form a neat, compact, streamlined unit substation for modern industrial service.

Wagner close-coupled transformers are available in ratings from 500 through 2000 kva. They are carefully designed to meet your distribution requirements.

Look to Wagner for better transformers that assure a continuous, dependable flow of power. Your nearby Wagner engineer will be glad to help you solve your loadcenter problems. Call the nearest of our 32 branch offices, or write us.



T54-II

Wagner

Throat-Connected Unit Substation Transformers

For outdoor installation, or for applications where it is desirable to locate the transformer away from the switchgear, Wagner can furnish thest liquid-filled transformers in ratings to 2000 kws, 15 kv and below. Bulletin TU-13 gives full information.

WAGNER ELECTRIC CORPORATION
6413 PLYMOUTH AVE., ST., LOUIS 14, MO., U.S.A.

TRANSFORMERS

INDUSTRIAL BRAKES

AUTOMOTIVE

BRAKE SYSTEMS-AIR AND HYDRAULIC

Wazner Electric Corporation

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

and the light dawned...



Jim Jones
...electrical contractor
...is a man
of considerable discernment,
and has a sharp eye
for a good deal.

He took great pride in his lighting jobs.
They weren't impressively large.
But they were well engineered
... efficient installations
that embraced the latest lighting practices.
And above all,
Jim had the satisfaction of having
initiated and sold the jobs.
How he yearned for an opportunity
to show them off.

Then one day Jim read about the Light's Diamond Jubilee LIGHTING COMPETITION FOR ELECTRICAL CONTRACTORS to "provide wide industry recognition for sales initiative and application of modern lighting technology by electrical contractors."

Jim's interest was stimulated immediately by the 18 cash prizes (\$1350 in all). But the money was a secondary consideration.

The real hook was having his entry published

in Electrical Construction and Maintenance

and receiving 1000 reprints of the published article for local sales promotion (if it won a first prize award). The recognition and business building possibilities

set him to thinking. "This Competition," thought Jim, "is the cat's meaw! It's right up my alley."

So Jim used this coupon ______ to send away for the official rules folder and some entry forms.

WHY DON'T YOU DO IT RIGHT NOW?

Lighting Competition Chairman
ELECTRICAL CONSTRUCTION AND MAINTENANCE
330 West 42nd Street, New York 36, N.Y.

Dear Sir:

Please send me a copy of the Rules Brochure and____Entry Forms for the Light's Diamond Jubilee LIGHTING COMPETITION FOR ELECTRICAL CONTRACTORS.

NAME___

COMPANY__

CITY



Jim found out that entering the Competition was a cinch, He's preparing his entry now, And rumor has it that he'll have several. Jim is confident that his entering the LIGHTING COMPETITION FOR ELECTRICAL CONTRACTORS is the brightest idea for building lighting sales since Tom Edison made his famous hair pin glow.

ELECTRICAL CONSTRUCTION AND MAINTENANCE

A McGRAW-HILL PUBLICATION 330 WEST 42ND STREET, NEW YORK 36

BULLDOG ALUMINUM BUStribution DUCT

helps North American build Super-Sabres





1600-amp. LO-X BUStribution serves as main feeder to welding department to minimize voltage drop during welds.



600-amp. Plug-In BUStribution, with tapoff provisions each 10", provides 100% coverage of production area with 50-foot runs.

To keep their famous Super-Sabre Jets rolling smoothly off the line, North American Aircraft needed a dependable, flexible power distribution system. That's why, in two installations alone, they installed more than half-a-mile of BullDog Aluminum BUStribution Duct.

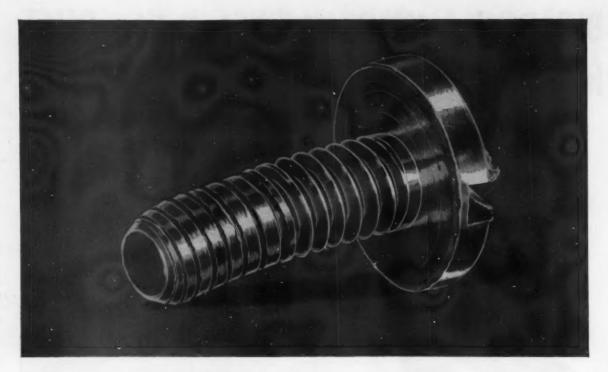
The high boy construction, and the obstacles presented by girders and pipes in the North American plant, were a natural for the use of lightweight aluminum bus duct. The weight saving in each 10' duct section greatly eased the strain of the extra handling required in the installation job. Less dead weight on building superstructures, too. These savings in installation costs—in addition to lower first cost—are prime reasons for the widespread use of BullDog Aluminum Conductors in plants throughout the country.

Aluminum BUStribution Duct features in its design the same quality and dependability that have gained BullDog world-wide reputation as a pioneer of bus bar distribution systems. It is completely interchangeable with other BullDog BUStribution systems and is listed by Underwriters' Laboratories, Inc. For complete information, consult your local BullDog Field Engineer. Or, write: BullDog Electric Products Company, Dept. EC-64, Detroit 32, Michigan.



Export Division: 13 E. 40th Street New York 16, New York In Canada:
Dominion BullDog Limited
80 Clayson Road, Toronto 15, Ontario

BULLDOG ELECTRIC PRODUCTS COMPANY



A cause of failure... now removed

New G-E wiring devices eliminate binding screws



HOW GE3800-LINE DEVICES WORK

Sturdy locking springs hold the entire stripped length of the wires securely inside contact channels as shown in the cutaway view above. These connections withstand a pull-out test of over 75 pounds with No. 14 Awg wire. Equally strong (and equally easy) connections are made with No. 12 and No. 10 Awg wires. Vibration won't loosen connections-yet, when necessary, the wires can be released by inserting a screwdriver in the release slots. All live parts are completely enclosed to avoid shocks and short circuits.

ASK YOUR G-E CONSTRUCTION MATERIALS DISTRIBUTOR

to demonstrate how GE3800-line outlets, switches, and lampholders with pressure-lock terminals provide

- EASIER CONNECTIONS
 BETTER TERMINATION
- PROTECTION AGAINST BREAKAGE

- Avoid stripped threads and breakage
- Just push in the wires to connect

It's so easy to mangle binding screw threads when working with No. 12 or No. 10 Awg wire-and when this happens you usually have to scrap the whole device. Now you can prevent this waste by using the new GE3800-line outlets, switches, and lampholders with pressure-lock terminals. They have no binding screws-and they are amazingly easy to wire. You just strip the insulation off the wires and push them into the terminal holes. There are no screws to loosen or tighten . . . no looping or bending of wires . . . no danger of connections vibrating loose. These devices mount easily in the box because the wires run straight out of the back.

GE3800-line devices with pressure-lock terminals are available in both standard and intermediate grades. All are listed by Underwriters' Laboratories, Inc., and meet Federal Specifications, Write for a free folder on this new wiring development. Section D127A-618, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

You can put your confidence in_ GENERAL & ELECTRIC

FOR MORE INFORMATION ON

NEW PRODUCTS CATALOGS, BULLETINS ADVERTISEMENTS

USE THESE CARDS

• PRODUCT NEWS, PRODUCT BRIEFS:

Use first line of boxes, Insert item numbers of products on which more information is desired.

CATALOGS, BULLETINS AND ENGINEER-ING DATA:

Use second line of boxes. Insert item numbers of literature desired.

ADVERTISEMENTS:

Use third line of boxes, Insert page numbers of advertisements on which additional information is desired. Where more than one advertisement appears on the page, include the manufacturer's initials.

IMPORTANT.

- · PLEASE PRINT LEGIBLY
- USE BLACK OR DARK BLUE INK
- . DO NOT USE PENCIL OR RUBBER STAMP

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Your Name and address are photographically reproduced and sent to the appropriate manufacturers.

Illegible or incomplete addresses may result in your not receiving the information you desire.

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The Editor
ELECTRICAL CONSTRUCTION AND MAINTENANCE
330 West 42nd St.,
New York 36, N.Y.

PLACE 26 STAMP HERE

The Editor
ELECTRICAL CONSTRUCTION AND MAINTENANCE
330 West 42nd St.,
New York 36, N.Y.

Year Name and address are photographically reproduced and sent to the appropriate manufacturers. Illegible or incomplete addresses may result in your not receiving the information you desire.

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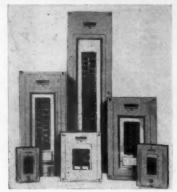
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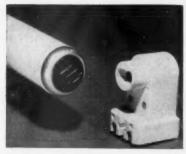
Product News



Load Centers (1

A new line of circuit breaker load centers for positive wiring protection in buildings of all sizes-from small homes to multiple dwellings and commercial buildings. These "unit breakers" combine thermal and magnetic trip, quick make and break, trip-free operation, ambient compensation and two position "on-off" lever movement. The three unit construction consists of a case with current carrying bus bars, breakers, and cover. Case has keyhole mounting slots, ample knockouts and wiring space. Individual breakers "push-on" to bus bars and feature out front terminals and straight wire connections. Six box sizes and seven breaker ratings cover all normal requirements up to 32 circuits. Custom made "on-the-job" installations are made possible since breakers are available in single-pole units with 15- or 20-ampere ratings, double pole breakers with 15-, 20-, 30-, 40-, or 50ampere ratings. Complete line includes single phase, three phase and split bus devices; lug mains or breaker mains; general purpose or raintight enclosures, and covers for flush or surface mounting.

Cutler-Hammer, Inc., 315 North 12th St., Milwaukee 1, Wis.

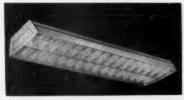


Fluorescent Lamp (2

A new type of fluorescent lamp which produces 35% more light than any previous light source. It is expected to find wide use in industrial, store, office and

school lighting installations. First of the new line is a standard cool white lamp, eight feet long and with a diameter of 11/2 inches. Rated at 110 watts, it has a total light output of 6800 lumens. Its rated life is 7500 burning hours. Base is of new design. It incorporates two contacts recessed in a single element, and allows lamp to be inserted easily in push-pull type of lampholders. Because of new base, and because its operating characteristics differ from all previous types, new lamp will be used only in new fluorescent lighting installations. Lamp employs the "rapid start" circuit. It is expected to be used for many out-of-door lighting jobs, such as for service stations, building floodlighting, signs, and others. First lamps will be in the 96-inch size, and in the standard cool white color. A 72-inch lamp is planned for later production, as are deluxe colors for store, office and school lighting jobs.

General Electric Co., Nela Park, Cleveland 12, Ohio.

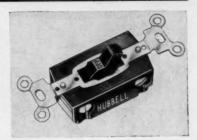


LIGHTING FIXTURE, called "The Falcon" is for school and office lighting. It has been designed to give 60% downlight and 40% up-light, with 35° by 30° lamp shielding. Unit is available with either "300° white" steel side reflectors, or translucent polystyrene sides. Available for 2-lite in all 4- or 8-foot lamps. Louver hinging provides access to lamps and starters for servicing and cleaning. Folder 928 is available. Manufactured by Edwin F. Guth Co., 2615 Washingson Blvd., St. Louis 3, Mo.

Sprockets (4)

Extension of the "off-the-shelf" line of Taper-Lock sprockets to include the 1½-in., 1¾-in. and 2-in. pitch sizes has been announced. They are compact, and flush design contributes to safety. They mount on shaft quickly and easily and hold with firmness of a shrunk-on fit. Bushings may be reused. Sprockets in the new larger pitches, up through the 26-tooth size are made of high carbon steel and can be hardened. Larger sprockets available in close-grained semi-steel. Bulletin is available.

Dodge Manufacturing Corp., Mish-awaka, Ind.



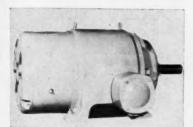
Switch (5)

A new alternating current switch, called the Topper AC Switch. Available in single pole and 3-way types, it is designed to give dependable, long life performance at full rated loads. The new 15-amp, 120-277-volt ac switch was developed to meet the need for a quiet yet dependable ac switch to withstand the inductive load characteristics of fluorescent lighting installations. It may be used at full-rated capacity on fluorescent loads at voltages from 120-277, on inductive loads 120-277 volts and on incandescent lamp loads. In addition, it may be used for motor loads 120-127 volts at 80% of switch rating.

120-127 volts at 80% of switch rating.

Harvey Hubbell, Inc., Bridgeport,

Conn.

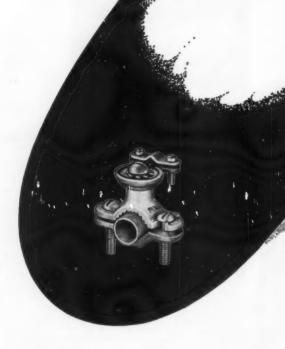


Motors (6)

Maximum ratings available of U. S. horizontal totally-enclosed and explosionproof motors have been increased to 150 hp. The totally-enclosed motors, known as Type SD, are designed for protection against dirt, moisture, oil and chemicals. The explosion-proof motors, Type SE, are designed for service where inflammable gases, volatile liquids or combustible dusts may be present. Type SE motors are supplied with UL label for Class I, Group D, and Class II, Groups F and G. Both type motors are double-enclosed with a built-in fan for full ventilation and greater heat dissipation. Additional features include asbestos-protected windings to withstand high temperatures; stator cover plate which can be removed for inspection or cleaning; solid, dynamically balanced, cast aluminum rotor; and Lubriflush bearings. Available from 1/3 to 150 hp. Bulletin

U. S. Electrical Motors Inc., Box 2058, Terminal Annex, Los Angeles 54, Calif.

ansolite of



Midwest Electric Myg. Company

Chicago 12. Illinois



Aerial Ladder

A new mechanical aerial ladder which can be mounted on almost any type body and chassis. Series 2200 MAL is for high overhead installation, service and/or maintenance problems. The ladder comes in three sizes, 23, 27 and 31 feet, ground to platform heights. Full extension, elevation to 72°, and 360° endless rotation of ladder can be accomplished by one man operating hand cranks on ladder pedestal mast. Manually operated lock pins hold ladder securely in any of 11 positions. Ladder rails are steel channel and truss rod reinforced. Upper and lower sections are insulated against 750 volts. Safety-type steps are attached to ladder pedestal.

J. J. Holan Corp., Cleveland, Ohio.



Emergency Light

(8)

When regular source of lighting power fails, this portable automatic emergency light goes into operation, instantaneously furnishing adequate light for eight hours. Features are: made of stainless steel; "flasher" built in to give warning for emergency use; "test" pushbutton switch provided; flexible rubber-covered cable includes a third wire for grounding the unit; switch is provided for desired charging rate-high or low. By means of a

pushbutton control switch, the "flashing" lamp can be changed to "steady" illumina-When normal power is restored, floodlight is automatically shut off, and battery is automatically recharged.

Perkins Battery Co., York, Pa.



Reflectors

Improved Duratach and solid neck reflector lines feature complete interchangeability. All reflectors are common to both links and are adapted to form complete Duratach or solid neck reflectors by a single component part assembly. There are three methods of handlingconsisting of basic pendant installation, with simple conversion to side outlet or outlet box. Solid neck's basic construction combines a reflector unit with a yoke, nut and socket assembly. For areas where vibration shortens lamp life, a "shock absorbing" element which fits both medium and mogul base sockets is available. Terminal screws in the Duratach canopy socket cap are exposed for easy wiring. Duratach features include built-in "shock absorbers" that cushion lamp filament against vibration, socket design that makes and breaks contact instantly, without arcing, as the reflector assembly is mounted in place or detached. Five models-RLM standard bowl, RLM 30° angle bowl, RLM deep bowl, shallow

dome and elliptical angle.

Wheeler Keflector Company, Boston, Mass.

(10)



OFFSET CONNECTOR for EMT, which eliminates the necessity for offsetting conduit at the knockout entrances of outlet and switch boxes. It is made of malleable iron and specially hot dip galvanized for long service life. It is available in a range of sizes from 1/2 inch to 2 inches. Manufactured by Gedney Electric Company, RKO Building, Radio City, New York 20, N. Y.



Receptacle

(11)

A new 3-wire grounding type duplex receptacle of the surface type, known as P&S 8672, is for use with non-metallic cable. It has two current carrying contacts plus a third contact to accommodate U-shaped grounding blades on special 3-wire caps. Ground terminals are identified by green hexagonal binding screws. It is designed to mount on 2-in. by 4-in. studs; has knockouts for No. 12 or No. 14 standard non-metallic sheathed cable, and double grip, long-life contacts. Rating is 15 amperes, 125 volts. Approved by UL.

Pass & Seymour, Inc., Syracuse 9,



Circuit Ereaker Panel

(12)

A new Stab-lok circuit breaker device, No. 2068, designed in accordance with the NEC, is a low cost service switch suitable for homes or small industrial operations. It has six 3-wire circuits which are fed in parallel from the 200-amp mains. One of these circuits controls the lower bus which can accommodate either eight single pole Type NA Stab-lok breakers of four 2-pole simultaneous trip circuit breakers. With the new "E" slots in the enclosure bus bar, the device will be able to accommodate ten lighting breakers in the lower bus. The enclosure is the combination flush-surface type. The interior is mounted on a pad and four leveling screws are provided for plaster adjustment. Main lugs are removable, solderless type, and ground bus is straight-through wiring type

Federal Electric Products Company, 50

Paris St., Newark, N. J.

ELECTRICAL CONDUIT PERMANENT EASILY INSTALLED LIQUID-TIGHT FLEXIBLE APPROVED Saberalones, Mar. SEALTITE (TYPE U.A.) is exposed to moistur or mineral oils (up to 60C). See N.E. Code, Art. 351.

SEALTITE **ELECTRICAL CONDUIT** PROTECTS WIRING

against oil, grease, water, dirt, chemicals, corrosive fumes, salt spray, weather

SEALTITE* is a flexible and liquid-tight electrical conduit. It gives maximum protection to your wiring when it must connect moving parts, absorb vibration, follow machine contours, flex into U-bends, be easily maintained or be safeguarded between misaligned ports.

It is being used successfully in wet locations, in tunnels, power plants, steel mills, canneries, chemical industries and in many outdoor applications. SEALTITE comes in two types:

TYPEU.A.—UL-approved. Made with flexible galvanized steel core, positive ground and tough outer cover.

NOM.		INSIDE DIA. (Inches)		DE DIA.	APPROX. INSIDE BEND DIA.	EST. WEIGHT per hundred ft.
(Inches)	Min.	Max.	Min.	Max.	(Inches)	(Pounds)
3/4	.484	.504	.690	.710	8	30.0
1/2	.622	.642	.820	.840	10	36.6
34	.820	.840	1.030	1.050	15	48.2
1	1.041	1.066	1.290	1.315	18	87.7
134	1.380	1.410	1.630	1.660	21	116.5

TYPE E.F. † (Extra Flexible)-for machine tools and industrial equipment. (Meets †Pat. Applied For

NOM. I.D. (Inches)	INSIDE DIA. (Inches)		OUTSIDE DIA.		APPROX. INSIDE BEND DIA.	EST. WEIGHT per hundred ft.
	Min.	Max.	Min.	Max.	(Inches)	(Pounds)
36	.485	.505	.690	.710	5	24.3
1/2	.620	.640	.820	.840	6	29.0
36	.815	.835	1.030	1.050	9	38.2
1	1.025	1.055	1.290	1,315	10	65.0
134	1.365	1.395	1.630	1.660	13	84.4
11/2	1.575	1.605	1.870	1.900	1.5	122.0
2	2.020	2.055	2.335	2.375	17	158.0
21/2	2.480	2.515	2.840	2 875	20	205.0
3	3.070	3.110	3.460	2,500	27	290.0
4	4.000	4.050	4.460	4.500	34	430.0

Commercial talerances apply on above figures.

ELECTRICAL WHOLESALERS stock both types. Buy it in long random lengths as shown; then cut without waste. Or ask your wholesaler to cut the length you need. Liquidtight connectors are available from wholesalers' stocks. Write for Bulletin UA-531. The American Brass Company, American Metal Hose Branch, Waterbury 20, Conn.



SEALTITE

flexible, liquid-tight electrical conduit an ANACONDA® product

FOR WET SPOTS

MOVING CONNECTIONS

OUTDOORS

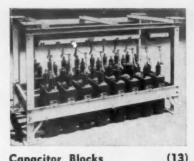
MISALIGNMENT







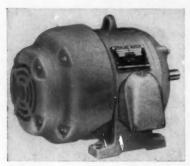




Capacitor Blocks

Factory-assembled capacitor blocks for use in open type banks at transmission, sub-transmission, and distribution voltages. They provide flexibility for relocation and permit changes in bank size as varying circuit conditions require. A standard block consists of two rows of 25-kvar, 5-kv or 8.7-kv class capacitor units connected in parallel and mounted in a galvanized steel frame of standardized dimensions. Ready for installation with similar equipments, available blocks have capacities of 250, 300, 350, 400, 450, 500, 550 and 600 kvar. Individual expulsion type fuses protect capacitor units. Base insulators are used to insulate banks from ground for full system BIL, and stacking insulators can be used between frames.

Line Material Company, 700 W. Michigan St., Milwaukee 1, Wis.



New advanced design totally enclosed, fan cooled constant normal speed motors, in frame sizes 182 and 184. They incorporate the new NEMA standards. Features are more horsepower in less space; heavy duty ball bearings; stator windings of advanced design; and new terminal boxes that may be rotated 360° to be fixed in any desired position and have a tapped hole for conduit.

(14)

(15)

Sterling Electric Motors, Inc., 5401 Telegraph Road, Los Angeles 22.

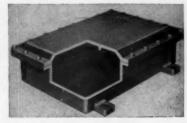
Cable

Underground feeder and branch circuit cable called Columbia-UF. It is a specially designed, all thermoplastic cable tested and approved by Underwriters' Laboratories and recognized by the NEC for use in wet, damp or corrosive loca-

tions. It is approved for direct earth burial in branch and feeder circuits when provided with overcurrent protection. It is resistant to acids, alkalis, lubricants, corrosive fumes and water, fungus, corrosion. Cable is available in single conductor, sizes 14 to 4 AWG, and in two and three conductor flat construction, sizes 14, 12 and 10 with and without ground wire. UF wiring is used in barns, where chemical and corrosive fumes have a deteriorating effect on wiring. It is also used as underground feeder cable between houses, garages, factories and outdoor lightposts. Folder is available.

Columbia Cable & Electric Corp., 255

Chestnut St., Brooklyn 8, N. Y.



Explosion-Proof Housings (16)

Explosion-proof housings for enclosing such electrical equipment as fuses, relays, motor starters and other equipment that must be operated in explosive atmospheres are found in refineries, synthetic rubber plants, natural gas plants and other such hazardous locations. Housings are made of cast aluminum alloy. Standard housings suitable for use on 2-in. conduit or smaller (1/2-in. walls) are available. For use with larger conduits, additional wall thickness is provided. Bulletin F-254 is

Adalet Manufacturing Co., 14300 Lorain Avenue, Cleveland 11, Ohio



Test Set

A new Universal "60" alternating current test set. There are four separate instruments in this set with their necessary switches which create: 36 ranges in watts from 5 watts full scale to 200 watts full scale; 7 current ranges from 10 milliamperes full scale to 10 amperes full scale; and 4 voltage ranges from 30 volts full scale to 300 volts full scale. It gives the complete picture of 60 cycle voltages, currents, power and power factor.

Sensitive Research Instrument Corp., 9-11 Elm Ave., Mount Vernon, N. Y.



A new motor rotation and phase tester for determining the direction of rotation of electric motors before they are connected to the line, and for determining the phase rotation or sequence of energized power circuits. It eliminates the need for temporary connections. It also determines the polarity of power and instrument transformers, and can be used as a continuity tester in checking electrical circuits. Bul-

letin 80-6 is available.

James G. Biddle Co., 1316 Arch St., Philadelphia 7, Pa.



Upright Bases

(19)

Complete uprights for lighting and other purposes can be quickly assembled with the aid of new metal-pipe bases, combining a rigid, threaded support for pipe with a junction chamber for splicing and grounding. Any desired length of upright can be cut from standard conduit or pressure pipe and threaded to screw into top of base. Necessary lighting fixtures or other equipment are mounted on top of pipe and wiring is run through pipe and spliced and grounded in the base. For uprights of average height, bases are supplied to accommodate 2-in. and 21/2in. pipe. Where taller standards are required, bases are available for 3-in. and 4-in. pipe.

Hope Electrical Products Co., Inc., 338A Wilson Ave., Newark 5, N.J.



Why Pay FOR STARTER CAPACITY NEVER USED?

THE ANSWER TO THIS QUESTION COULD SAVE hard-earned dollars needlessly thrown away.

When choosing from the widest range of starters in the 1-50 hp range, you save by selecting the starter matched to the job—with no wasted capacity.

Furnas Electric starters—nine of them in the 1-50 hp range—are designed and built to match most applications.

Save 25% TODAY

Here's an example of typical savings you can earn through proper starter selection: for 10 hp service, for example, you'd select Furnas Electric Type YE rated for the job. This saves you up to 25% on initial costs and 40% on space over a YF size 2 (rated 25 hp) normally selected for 10 hp service.

All of the nine Furnas Electric sizes offer worthwhile savings.

Important FEATURES

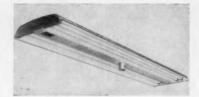
Furnas Electric starters give you these additional benefits. Dual Voltage Coils—matched to motor voltage. Thermal Overload Protection. Shallow Case for easy wiring. Durability to stand up under rough service. Arc Resistant Terminal Board. Arc Quenching Silver Contacts.

Complete RANGE OF

Pressure switches for air and water applications. Drum controllers for reversing, multi-speed and reversing multispeed service.

Write today for full story or contact our representative near you. Furnas Electric Co., 1067 McKee St., Batavia., Illinois.





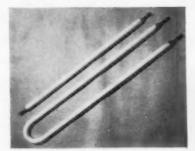
Lighting Fixtures

A new line of low cost, open type, horizontal fluorescent fixtures for service station use in warm climates. It is known as the "Sun Liner" and is designed for either under canopy or pole-mounted use, and is available with a choice of two or four 73-watt 8 ft. slimline lamps. Unit is completely wired, ready to install, and is listed by UL for outdoor use. Channel and reflector assembly are of die-formed 18 gauge steel, and finished with baked on primer coat and baked white enamel finish coat. End plates and lampholder plates are of anodized aluminum. Bulletin 154 is available.

Guardian Light Co., Oak Park, Ill.

(21)

(20)



COLD CATHODE LAMPS made in the 1.5 inch (T/12) diameter. The 35mm 240 MA lamps may be used for both ballast and transformer operation. Available in standard 4-, 6-, and 8-foot lengths or may be curved to meet design requirements of a custom lighting installation. They can be dimmed and start instantly. Lamps can be had in numerous colors. Manufacturer is Cold Cathode Lighting Corp., 42-40 27th St., Long Island City 1, N. Y.



Two-Way Radios

A new line of 144-174 mc., 10- and 25watt FM mobile two-way radios known as the Universal Uni-Channel Series. They operate interchangeably from either 6- or 12-volt automotive electrical systems without any circuit modification and fea-

(22)

ture a long-life, dual-interrupter all vibrator power supply for operation of both transmitter and receiver circuits. It permits greater flexibility in operation of radio equipped fleets having vehicles with both 6- and 12-volt systems, since mobile units may be interchanged without regard to the type of vehicle. Models are available for under-the-dash mounting with local controls and for trunk-mount installation with microphone, control head and speaker installed near the driver. Both units are 6 inches high, 97%-in. wide and 18¼-in. long. Transmitter, receiver and power supply are mounted on separate chassis which are assembled within a drawer-type housing.

Motorola, 4545 W. Augusta Blvd., Chicago, Ill.

Converter

(23)

A new line of horizontal "Nobrush" frequency converter units. Standard types convert 60 to 400 cycles. Unit is two-bearing consisting of compact induction motor, direct-coupled to "Nobrush" 400 cycle generator. Unit is ideal as component of power or electronic equipment. Outputs available in this design, from 100 volt-amperes to 1½ kva single phase, 150 volt-amperes to 3 kva three phase; three phase or single phase drive.

Georator Corporation, Manassas, Va.



Instruments

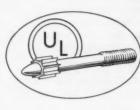
(24)

A new line of process instruments including potentiometric and ac bridge recorders and recording controllers. They are designed for continuous measurement and control uninterrupted by periodic standardization, incorporate new measurement circuitry and components. Among the new features are a magnetic standard in the potentiometric system and a bridge-balancing unit in the ac bridge system. Both models are available with either electric or pneumatic control. Heart of the ac bridge system, the new bridgebalancing unit supplies power to the bridge and provides a means for rebalancing it. Other advantages include plugin components, anti-backlash gearing, internal illumination, and a pen-inkwell assembly designed for automatic realignment. Chart speeds are 1, 4, 8, 12 and 24 hours, and 7 days.

General Electric Company, Schenectady 5, N. Y.

DRIVE-IT SAVES 30% IN LIGHTING INSTALLATION COSTS!

Electricians in new Northwest factory use DRIVE-IT 320 for overhead installations. 18,000 pins were used on fixtures and leads.



Drive pins are Underwriters' Laboratories approved.



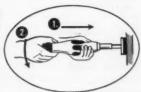
DRIVE-IT 320

BREAK-OPEN ACTION

Snap open action results in the fastest operating tool on the market. Easiest method to load and eject cartridges under any condition.



Exclusive Safety Pads developed for specific jobs such as conduit clamp, brackets, or fuse boxes.



SEND

THIS

FOR FULL

DETAILS

Three-way Safety. Cannot be discharged accidentally, due to the push and turn firing sequence. This, plus the large, swivel safety pad, makes DRIVE-IT triple safe.

More fastenings per hour with this speedy way of loading and ejecting cartridges.

DRIVE-IT

the original POWDER-ACTUATED TOOL

POWDER POWER TOOL CORP.

Dept. I, 7526 S.W. Macadam Ave., Portland 1, Ore.

Canada: Ammo Power Tool Co., Ltd. 735 Broadway, Vancouver, B. C.

☐ Please send FREE catalogue and literature.
☐ I want a FREE demonstration of DRIVE-IT.

Name

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City__

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G&W Oil Fuse Cutouts Protect men and equipment



The type "FC" oil fuse cutout is primarily intended for fusing or switching primary circuits in underground or overhead installations. The cast steel tank (hermetically sealed and oil filled) provides maximum protection by safely withstanding the high pressures created when the high voltage fuse clears a heavy short circuit.

The switching contacts are beryllium copper. Fuse links are simple and inexpensive, easily replaceable in the carrier on the removable cover of the tank.

Welded steel boxes with cutouts on top, enclose connections to feed and load circuits.

The gang operating mechanism provides for three phase load break switching.



	RATING	S
Size	Volts	Ampere
FC31	2,500	100
FC42	5,000	200
FC62	8,000	100

Bulletin CA52 gives data and prices. Write for copy or ask your representative.

G & W ELECTRIC SPECIALTY CO. 7780 Dante Avenue, Chicago 19, Illinois

Representatives in principal cities of U.S.A. In Canada—Powerlite Devices, Ltd., Toronto







Upper Structure

(25)

A new upper structure which can be added to Morrison Carry-All bodies to create a totally enclosed service unit. It provides a protected, covered working area—six extra inside shelves running the full length of the upper structure—extra cubic feet of covered carrying space—full height, lockable rear doors—and driving vision through rear cab and rear door window. It is available for all Carry-All service bodies for ½, ¾ and 1-ton chassis. It can be purchased with a new body or added to carry-all bodies already in service.

Morrison Steel Products, Inc., 601 Amherst St., Buffalo 7, N. Y.

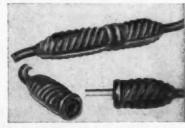


Power Drive

(26)

The Ridgid portable power drive for threading, cutting and reaming pipe with hand tools is now made with a new wrenchless speed-grip chuck. To operate, grip-tooth jaws are closed on work by hand wheels, socked lightly, then motor action holds work tighter. Release by hand wheel. The "400A" power drive handles ½-in. to 2-in. pipe, ¼-in. to 2-in. bolts, has ample power for geared tools to 12 inches.

Ridge Tool Company, Elyria, Ohio.



Connector

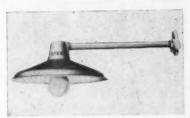
(27

A new heavy-duty, single pole, electrical connector which uses a friction-pressure principle to provide quick joining or disconnecting. Unit is composed of two sections—one with a male contact, the other with a female. All principal parts are of heavy-gauge copper, and

wires are connected to the plug ends by set screws. Pyramid copper contacting parts give a wiping pressure contact. Connector is for either indoor or outdoor service for such applications as: line repair operations, lifting magnets, welding machines, battery chargers, tap changers, motor connections, testing equipment, air compressors, portable machinery. Unit is available in two sizes: Model MF-2 handles wires from No. 8 to No. 0 stranded B & S gauge, up to 200 amps. Model MF-4 is for wire diameters from No. 2 or No. 00 stranded B & S gauge, up to 400 amps.

H. W. Earl Co., Coral Gables, Fla.

(28)



YARDLIGHT with dual filament lamp for safety around farm, ranch or home. It is equipped with special socket to accommodate standard PS-25 dual filament 150-watt lamps. Both filaments burn simultaneously. When one filament burns out the other continues to operate. Available with aluminum or steel reflectors finished in porcelain enamel or Ultranamel. Manufactured by Steber Manufacturing Co., Broadview, III.



Sump-Pump Motor

(29)

A new sump-pump motor with aluminum end-shields, cast aluminum rotor, and welded steel shell. Formex insulated windings plus slot and between-phase insulation of polyester film provide extra protection against humidity and cellar dampness. Entire stator assembly is protected by a dip-coat of Glyptal water- and heat-resistant varnish. Meeting NEMA standards for sump pumps and cellar drainers, the new open dripproof motors, type KH (split phase), are equipped with drip-cover, built-in switch, and bottom flange for direct mounting. Weight or float switches are optional. Rated at ½ hp, motor is available in 50 cycle-1425 rpm and 60 cycle-1725 rpm models, and 115/

General Elec. Co., Schenectady 5, N. Y.

FAST, EASY INSTALLATION MINIMUM

....

MAINTENANCE MAXIMUM **EFFICIENCY**

USER

SATISFACTION

ONLY ELECTROMODE ALL ELECTRIC **HEATERS** have all

Triple Assurance With . . .

ELECTROMODE'S Advantages Add Up To YOUR PROFIT

Here are some of the many places where ELECTROMODE can be profitably used:

HARD-TO-HEAT AREAS . FACTORIES . OFFICES . ISOLATED BUILDINGS . PUMP HOUSES . METER HOUSES . WATCHMAN TOWERS . FACTORY OFFICES . LOBBIES . STORAGE ROOMS GARAGES and many other locations.



SUSPENSION TYPE

available from 10,000 to 45,000 watts (34,150 to 153,875 btu). Adjustable louvers permit directing heat into working zone. Model 14-10 illustrated.



COMBINATION PORTABLE

and Suspension type. Available from 1500 to 7500 watts (5,122 to 25,613 btu). Adjustable louvers permit directing heat into working zone. Model AN-30A illustrated.



EXPLOSION-PROOF

for heating hazardous areas subject to explosion. Available in three sizes: 2000, 4000, 6000 watts (6830 to 20490 btu). Model CX-2 illustrated.



AUTOMATIC WALL-TYPE

with Down-Flo principle distributes clean, healthful, fan-circulated heat at floor level. Available from 1500 to 4000 watts. Model WA illustrated.

100%



tor wires are insulated and embedded

within a finned aluminum casting, assuring positive ing, assuring positive protection from fire, shock or burn. This finned type element acts as a superior heat diffuser, resulting in greater heating economy.

5 YEAR GUARANTEE

The patented, cast-aluminum heating element is guaranteed for five years against all defects of material or workmanship.

The Famous GE UNIT MOTOR

Totally enclosed construction protects motor from entry of dust. Large supply of oil sufficient for years of motor operation is factory-sealed-in. Forced lubrication system assures long life and quiet opera-

SAFETY SWITCH

Built into every Electromode Heater is a small thermal safety switch, located on or near the heating element. If for any reason the air flow should stop, causing overheating of the element, this safety switch auto-matically shuts off the current.

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ept.	EC-64,	45 Cr	ouch	Street,	Rochester	3, N.	٧.

Please send us your FREE Electric Heating File, containing specifications, illustrations, installations, prices and how to figure electric space heating.

We are interested in Electromode Industrial Heaters

Electromode Home and Office Heaters

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Controlled quality in every operation makes FCCV FITTINGS best!

All EFCOR Electrical Fittings undergo a series of rigorous gauging tests to insure trouble-free performance under all conditions.

EFCOR manufactures a complete line of quality fittings, made of malleable iron or steel, for every type of installation.



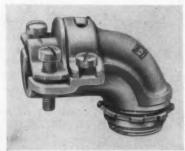


Window Fan

(30)

A new electric reversible 20-in. window fan, Model RV20. The 2-speed cabinet model fan, powered by a heavy-duty ½ hp motor, delivers 3500 CFM. Fan either exhausts or circulates air. Finish is ivory baked-on enamel. It measures 24-in. wide and 22½-in. high, has expandable metal wings for installation in windows up to 44 inches wide.

Fan Division, International Oil Burner Co., 3800 Park Ave., St. Louis 10, Mo.

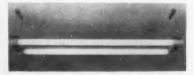


Connectors

(31)

The "Universal" 90° angle box connector No. 300 designed to accommodate armored cable, armored lead cable, armored lamp cord, flexible steel conduit and service entrance cable. Connector is available in eight sizes from ½-in. to 2½-in. Castings are special alloy sand cast aluminum and clamp will conform to round or oval cables.

Blackhawk Industries, Dubuque, Iowa.



Lighting Fixture

(32)

Low-brightness fluorescent lighting fixture, called De Luxe Budgetlite, is for use in classrooms, drafting rooms, offices, stores, manufacturing areas, etc. The aluminum tubes serve as a frame for the fixture and as wireways. Ballasts and lampholder assemblies are in end pieces. Hangers, adapted from steel wire spoke

used in motor cycle wheels, are slender but strong. Instant start lamps of large diameter (2¼-in.) tubes are used.

Ainsworth Inc., 38-10 29th Street, Long Island City 1, N. Y.

(33)

OUTDOOR LANTERN, AL-2690, is a one piece porcelain fixture, jet black glaze, with a black trimmed glass shade. It is not affected by salt atmosphere, heat or humidity. It will not rust and discolor house. Diameter at base is 43/4 inches, extends out 53/4 inches and uses 75-watt or smaller for 31/4-in., 4-in., or switch boxes. Manufactured by Pass & Seymour Inc., Syracuse 9, N. Y.



Circuit Breaker

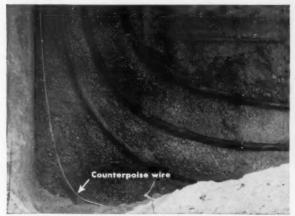
(34)

New 2-pole EQ molded case circuit breaker is designed for use in panelboards, load centers, or individual enclosures. Breaker has a common tripper bar arrangement as an integral part of trip mechanism. It is twice the width of single pole EQ design. It combines thermal and magnetic tripping for protection. Breakers feature arc chutes, silver alloy contacts, and a quick-make, quick-break, trip-free mechanism. They are factory-calibrated at controlled temperature (25°C) and factory-sealed to prevent tampering. Approved by Underwriters' Laboratories, Inc. Available in ratings from 10-50 amperes; 120/240-volt ac; 5,000 amperes interrupting.

I-T-E Circuit Breaker Co., 19th and Hamilton Sts., Philadelphia 30, Pa.



Direct-burial cable jacketed with NEOPRENE assures the dependable lighting airports need



POWER CABLES like these can be buried directly because tough, resilient neoprene jacketing resists soil acids, moisture and abrasion. Note "counterpoise" wire of bare copper for lightning protection at left.



MOBILE MIXER lays a bedding of clean sand under the cables . . . helps prevent mechanical damage from rocks. For added protection, another layer of sund is poured on top of cables before trench is filled.

A flick of a switch, and current must flash beneath busy runways to beacons and landing lights far across the field. Even a momentary power failure can mean disaster. Here, where dependable service can be a matter of life and death, contractors depend on rugged neoprenejacketed cable.

Neoprene-jacketed cable combines top durability with ease of installation. The tough, resilient neoprene jacketing resists crushing and abrasion... protects against moisture and prevents corrosion damage from soil acids and galvanic currents. Yet neoprene is lightweight and flexible and makes cable easy to handle.

YOUR SUPPLIER is the man to see for more information about durable neoprene-jacketed wire and cable for *all* installations—whether above ground, in conduits, or in the ground itself.

The Neoprene Notebook.

Each issue brings you new, unusual applications of neoprene ... new products ... interesting stories. Send in the coupon below to get on the mailing list.



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NEOPRENE

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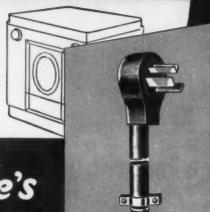
BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

E. I. du Pont de Nemours & Co. (Inc.) Rubber Chemicals Division EC-6 Wilmington 98, Delaware

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with "L" Shaped **Grounding Contacts**

It's here... Rodale's complete new line of Dryer Cord Sets ... 30-Ampere, 3-wire devices especially designed for electric dryers, and endorsed by the nation's leading electric dryer manufacturers. No more makeshift installations ... now you can be sure, you can be safe, you can save on time and money...use the units manufacturers recommend!

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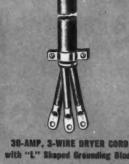
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with "L" Shaped Grounding Blads Cat. No. 542-4 - 4 foot length Cat. No. 542-5 - 5 foot length

Cat. No. 542-6 - 6 foot length



30-AMP, 3-WIRE SURFACE RECEPTACLE with "L" Shaped Brounding Slot Cat. No. 648 - Brown Bakelite Cat. No. 848V - Ivory Bakelite



30-AMP, 3-WIRE FLUSH RECEPTACLE with "L" Shaped Grounding Slot Cat. No. 649 - Brown Bakelite



Generators

Two new engine-generators that are light weight for easy carryability. F2500 delivers de electricity, has an output of 2500 watts with four 115-volt outlets: F3000 delivers ac instead of dc, with 2000 watts continuous capacity, 3000 watts starting capacity, four 115-volt outlets, each weighs 148 lbs. Aluminum base and aluminum guard are used.

Wincharger Corporation, Commerce Bldg., Sioux City,

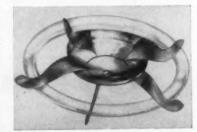


Support

The "Box-Lok" switch and outlet box support employs the toggle bolt principle. It will secure a box to a wall in a matter of seconds. Box protrusions and uneven structure behind wall are no hinderance as "Box-Lok" can be secured at any point along the sides of the box. It eliminates the necessity of inserting supports before placing box in opening.

Metalectrics Inc., 677 Broadway, New

York 12, N. Y.



Circline Fixtures

A new line of circline lighting fixtures. One of the features is the perforated steel louvers, which are utilized not only as lamp supports but also as a means of obtaining a low brightness effect. The "Halo" unit is designed to incorporate the wide-diameter 40-watt lamp. The design eliminates ceiling shadows without cutting down on lighting performance. All fixtures are available in baked white enamel with chrome center ornament, or in all-chrome. Louvers are finished in aluminum grey. Instant-lighting ballasts are UL approved. Catalog is available.

Carter Lighting Co., Chelsea, Mass.

(38)



SKIRTED HI-HAT employing a perforated flange which extends skirtlike, below the ceiling line, for commercial or residential installations. A wide range of double-sprayed, double infra-red baked color-coordinated finishes are available. No. 1020 is for the 75-watt R 30 reflector lamp and No. 1021 for the 150 watt R 40. Both are approved by UL. Manufactured by Litecraft Mfg. Corp., 8 East 36th St., New York 16, N. Y.



Electric Jig-Saw

Dalton portable electric jig-saw (Model D-500) cuts outlet box holes and other rough-in work. It can cut any materialwood, plastics, metals, composition boards, hard rubbers and others. Any shape can be sawed-circles, curves, straight lines and intricate designs—and it can be used as a rip, crosscut, coping, jig, scroll, band or keyhole saw. Features include a pistolgrip handle, 4 to 1 gear reduction, all gears hardened steel, an exposed motor for cool running, Anti-Kink spring, a built-in compressor which functions as a cooling unit. Unit comes equipped with five different blades.

Kapner Hardware, Inc. 2248 Second Ave., New York 29, N. Y.



Check appliance current at receptacle



Instantly determine if fuses are good



Know if windings are grounded



Trouble-shoot relays quickly



Know if the load is balanced



Expand low-amp reading by doubling lead

Eliminate Guesswork!

NOW EVERY MAN CAN BE EQUIPPED WITH THIS POCKET VOLT-AMP TESTER

Here is a real improvement for the men on your crew who now use a voltage tester. It's the Amprobe Jr., a pocket tester that measures both voltage and current, with instrument accuracy, without shutting down equipment. And the cost is only \$19.85 (just a few dollars more than an ordinary voltage tester), so every electrician and plant maintenance man can carry one.

Pick the Amprobe Jr. that fits the job. 7 models from 0-10 amp to 0-100 amp; choice of either 0-125/250 volts A-C or 0-150/600 volts A-C range. For higher current appli-

mprobe Jr. snap-around volt-amp tester \$ 985

cations, multi-range Amprobes available for 300, 600 or 1200 amperes. See the full line of Amprobe snap-around volt-ammeters at your jobber's today. PYRAMID INSTRUMENT CORP., LYNBROOK, N.Y. (Export Div.: 458 Broadway, N. Y. 14)

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here's why

1. Interlocking principle prevents slipping under any load. 2. New type wide base lugs cannot shear. 3. New nose design for gripping small objects. 4. Patented design of tension edge eliminates stress concentration at channels. 5. Interlocking design minimizes stress on joint bolt. 6. Precision machined interlocking surfaces result in perfect fit, distributing pressure evenly. 7. "Rite Angle" teeth guarantee maximum bite and minimum wear. Look for the Channellock line when you're shopping for hand tools. Channellock pliers offer features that you can't get with other makes. And when you buy a Channellock plier, ask to see the full line-you'll find a



style and model to do any job better.

THE PLIER DESIGN THAT OBSOLETES ALL OTHERS CHAMPION BOARMENT TOOL CO. . MEADVILLE, PA.



Relay

A new time delay relay combining the advantages of hydraulic-magnetic silicone operating principle with the convenience of plug-in construction. Type F Silic-O-Netic time delay relay is compact and hermetically sealed against dust and moisture with an inert gas fill optionally available. Relay is provided with standard delay periods from 1/4 to 120 seconds. The core is hermetically sealed in a non-magnetic metal tube extending through and beyond a solenoid coil. They are furnished with either octal-pin or solder-lug terminals for operation on 24 to 220 volts ac; 12 to 125 volts dc. Contact capacity is 3 amps at 120 volts, ac, or 1 amp at 50 volts dc, with S.P.S.T. through D.P.D.T. switching actions available. Bulletin 5201 available.

Heinemann Electric Co., 413 Plum St., Trenton 2, N. J.



Air Cleaner (41)

"Filtered Air" for allergy sufferers is now provided by a room-size air cleaner using static electricity. Named the "Micronaire" electrostatic air cleaner, it strains out smoke, pollen, dust, lint and many types of germs. It uses approximately the same amount of current as a 40-watt electric light bulb. Air is drawn into machine by a motor-driven fan, and is passed over a series of metal plates which are closely spaced. Every other plate is electrically charged with the static force that makes the plate act as a magnet for dust and other impurities in the air. As the air rushes along between the plates

the airborne particles are attracted to the plates and cling there. It weighs 60 pounds, and is mounted on casters for easy wheeling from room to room. It is 30 inches high, 15 inches wide and deep. Machine is plugged into a wall outlet.

Raytheon Mfg. Co., Waltham 54, Mass.



Pipe Cutters

(42)

New automatic knife pipe cutters for hand or power use. Different types of knives are available for cutting, beveling for weldments or grooving for compression type joints, and for cutting Saran lined pipe. They can be changed for the various operations. Knives have the "Safe-ty-Depth Guide" ahead of the cutting edge to prevent "hogging in" and knife breakage. Made for use with the Beaver Nos. 5, 10, 104, 106, 108 and 112 geared cutters, ½-6 to 12-inch, plus A, B and E pipe machines, ½- to 2 inch.

Beaver Pipe Tools, Inc., Warren, Ohio



Motor

(43)

A new totally enclosed motor has been designed for tuconite mill service. It is available with or without internal gearing. In the motor shaft, seals are provided with extra long sleeves of close tolerance and made of non-magnetic material. Seals are composed of brass and bronze. Both end brackets and retaining bolts are compound-sealed. A filtered path of low resistance is provided in the housing. Therefore, any air drawn in during periods of expansion and contraction is forced to follow a filter path and will not pass through bearings. Windings are armored with asbestos, baked and rebaked after each dipping of wound stator in a bath of asbestos. Literature is available.

U. S. Electrical Motors Inc., Box 2058, Los Angeles 54, Calif.



LIGHTWEIGHT CHAMP

Makes Dies Work Better...Longer

An exclusive Oster design feature found on the Lightweight Champ is the two driving arms on center line with spindle. They even up the load on the die stocks... prevent excessive strain and wear on one side of the die. As a result dies last longer and produce the accurate threads that mean a good job every time.

Other features of the Lightweight Champ help make it an outstanding value. Like the new wrenchless chuck that grips and holds tight in either right or left hand direction; revolving non-binding rear chuck; easy access to either motor or switch. The Lightweight Champ has an all-welded, steel case . . . absolutely indestructible . . . guaranteed for the life of the machine. But, in spite of the tough, rugged construction, it is easy to move from job to job. The standard range is ½" to 2". Range with drive shaft is 2½" to 8".

For complete data, write us or, better still, contact your local Oster distributor.

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Main Office and Factory:

2081 East 61st St., Cleveland 3, Ohio

Builders of Cost Reducing Threading Equipment Since 1893



See your industrial, hardware or electrical supplier

ARRO EXPANSION BOLT COMPANY

1540 Boone Ave., Marion, Ohio



FHP Motor

(44)

A new 51/2-inch diameter shaded-pole motor, designed for heavier duty at increased efficiency and low input current. Type KSP-39 motor is available in ratings of 1/12, 1/10, 1/8, and 1/6 hp, for use on room air conditioners, furnace fans, unit heaters and coolers, window fans, and general fan and blower applications. Optional features include internal baffling, single- and double-shaft models, and resilient-base, cushion-ring, or shaft-end mounting.

General Electric Company, Schenectady 5, N. Y.



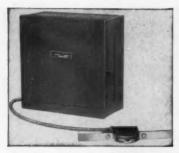
Receptacles and Connectors (45)

A new line of Hart-Lock interlocking receptacles and cord connectors, featuring "No-Trak", non-tracking, non-carbonizing molding material. Listed as standard by UL they offer improvements and advantages for industrial applications and for heavy-duty use where interlocking connections are required. Connectors in the new line have a "No-Trak" molded insert surrounded by a rubber body and feature adjustable cord grips. The receptacles are backed up by a Bakelite plate. The line is available in 2-wire, 3-wire or 4-wire types. The 2-wire devices are rated at 20 amperes, 250 volts, while the polarized 3-wire and 4-wire devices are rated at 20 amperes, 250 volts ac or dc, or 10 amperes, 600 volts ac. All receptacles are both back-wired and side-wired. Arrow-Hart & Hegeman Electric Co.,

Hartford, Conn.

Electronic Control

Impact actuated electronic controls for operating die protection mechanism, work stoppage signals, counters, etc., by the impact of falling parts. It is called Impak-Switch, consists of an impact-sensitive pickup connected to an electronic amplifier and relay with shielded, plastic-covered cable. The impact against the impact



pickup of 1/10th ounce falling two inches will operate the control. Impact pickup may be attached to a larger plate or to a chute. Proper mounting depends on size of objects and velocity of impact. For operation by small objects, pickup can be furnished with anti-vibration mounting bracket assembly. Literature is available.
The Autotron Company, P. O. Box

722-DD, Danville, Ill.



Pushbutton Stations

Electric pushbutton units are available in a wide range of combinations that fit into most manufacturers' equipment. Features are easy wiring, dependable opera-tion, flexibility of mounting and compact enclosures. All units are interchangeable, being of same size, and can be front or back mounted. They are individual, and not grouped in blocks. Units are of molded thermal setting plastic. Pilot lights, selector switches and pushbuttons are available in control stations and pendant stations in any combination.

Furnas Electric Company, 1067 McKee St., Batavia, Ill.

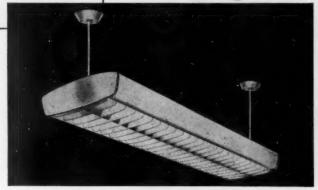
Contact Paste

(48)

Contax is a contact paste for lowering the resistance of electrical connections and providing long term corrosion protection. It is for aluminum to aluminum and aluminum to copper connections. It is applied to conductor and connector with a brush. It has excellent adherence to metal and will withstand washing action of wind and rain. Contax is supplied in ½-lb tubes, pint, quart and gallon cans.

Jasper Blackburn Corp., 35 Madison St., St. Louis 6, Mo.

is Believing



The Arthur

A & B 14000

4 & 8 FOOT FLUORESCENT LUMINAIRES

SERIES

Using standard or slimline lamps

A VERSATILE DIRECT-INDIRECT LUMINAIRE FOR INDIVIDUAL OR END-TO-END PENDANT MOUNTING

The 2-lamp Arthur, with its direct-indirect component is designed specifically for pendant mounting. Sloping ends, plus trim, shallow lines and all white finish give the unit particularly light and graceful appearance.

Diffusing polystyrene side panels and 35° x 35° louver shielding result in an eye-comforting brightness pattern. When lighted, the Arthur blends harmoniously into the

Open chassis construction makes the unit easy to install; all metal parts are die formed; 8-foot units require hangers only on the ends. Side panels slip into position; hinged louver opens or removes quickly. Unit is wired complete, ready to install, less lamps.

WRITE FOR BULLETIN NA And engineering data for the Arthur.

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REPRESENTATIVES IN PRINCIPAL CITIES WHOLESALERS EVERYWHERE

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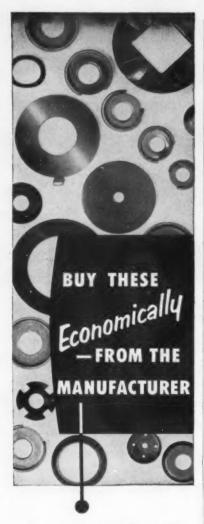
Yes-I want to know more about The Arthur, A & B 14000 Series, Fluorescent Luminaires. Send Bulletin NA.

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When you're ordering CUP WASHERS for binding screws; FLAT WASHERS; SPRING TENSION WASHERS, spherical or form rim type, whether you want them made from spring brass, phosphor bronze, or spring steel, and tempered: save yourself money by buying from the manufacturer.

The Whitehead Catalog lists hundreds of washer sizes; cable clips; pipe, conduit, and wire clips; burrs, plugs, spacer shims, retainers, gaskets. Write for this catalog and—buy what you need from it—Economically!



1679 W. Lafayette Blvd. Detroit 16, Michigan



Scaffold

(49)

A scaffolding, called Tasco, with a builtin safety feature which provides a locking
device for joining and holding scaffold
frames rigidly. The locking device is an
integral part of scaffold frame. Frame
is made of steel or aluminum. Locking
device on scaffold permits a section to
be folded for storage or carrying to a
new location. Basic frames are made in
sections which are 2, 5, 7, 10 and 20 feet
in length. Height of each section is 2 feet.
Units can be built up to 300 feet high.
Scaffolding when built up can be mounted
on casters for movement about buildings or institutions.

American Scaffolding Co., 1815 Woodland N.E., Warren Ohio.



Poly-V Drive

(50)

Poly-V drive is a new concept of power transmission. The Poly-V belt, which is a single, endless rubber belt with a series of parallel V ribs molded lengthwise around the inside circumference, has an uninterrupted, high-strength member of synthetic cords across its entire width. The Poly-V sheave grooves are designed to mate precisely with the belt ribs, and since belt covers full width of drive member, load is distributed equally over entire driving surface. Poly-V is available in two cross-sections, No. 187 and No. 375. They meet all drive requirements from 3-inch pitch diameter sheaves and

50-inch belt pitch length upwards. No. 187 is designed for applications where A, B or C section multiple V-belts would be used; and No. 375 for C, D, or E applications.

Manhattan Rubber Division of Raybestos-Manhattan, Inc., Passaic, N. J.



Instrument

(51)

A new portable, hand tachometer, featuring a scale-changing device. Three different models, each having three ranges, are capable of measuring rotational speeds from 2 to 100,000 rpm and linear speeds from 2 to 10,000 fpm. with accessories. Applications include speed measurement of motors, generators, turbines, lathes, milling machines, planer beds, shapers, band saws, conveyor belts, and all continuous webs. Equipment consists of two basic units: a head, which is placed against the moving object, and an indicator, which is attached by a two-foot flexible electric cable. Head unit includes a rotating shaft which operates a set of contacts through a positive cam mechanism, Indicating unit incorporates a reactance circuit, a multiscaled milliammeter, and a flashlight-cell power supply.

General Electric Company, Schenectady 5, N. Y.

(52)



PORTABLE LIGHTING UNITS for garden and play area. They are completely wired and include aluminum ground spikes for turf mounting. Cord sets of 10 or 25 feet are supplied. Several units may be used, connected one to the other, from one power supply outlet. Bulletin No. 135-54 is available. Made by Steber Manufacturing Co., Broadview, III.



Here's the best way to prove that

NEW G-E WHITE IS EASIER TO BEND

Every time you bend or thread new G-E white conduit, you'll prove to yourself that metallizing makes your job easier. Metallizing is a completely different galvanizing process that permanently bonds a uniform coating of pure zinc to the entire exterior of the conduit, even the threads. The excessive heat, quenching, and straightening used in other galvanizing processes are eliminated with metallizing. The result is a more ductile conduit that is easier to handle.

EASIER THREADING. Metallizing produces a unique zinc structure that acts as a lubricant for cutting tools. Threads are easier to cut right on the job.

EASIER FISHING AND WIRE PULLING. New G-E White has a tough, corrosion-resistant, organic coating tightly bonded

to the inside of the conduit. This coating contains an antifriction agent that permits conductors to slide through the conduit easily, thus cutting fishing and wire-pulling time and effort.

BETTER CORROSION RESISTANCE. Metallizing, covered by a tough coating of C-553 lacquer, produces a conduit that has been proved exceptionally resistant to smoke, heat, humidity, acid fumes, alkalies, and salt atmospheres.

New G-E white conforms to all Federal Specifications, American Standards Association Specifications, and is listed by Underwriters' Laboratories, Inc. Ask your distributor for more information or write Section C48-618, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

Progress Is Our Most Important Product







MORE TIME-SAVING installation features BUILT IN

- Sidewall fans packed complete in one carton. Outside housing slides out for installation—nothing to disassemble.
- Ceiling fans packed complete in one carton. Inside housing immediately available for preliminary installation. Carton includes motor, blade and grill in smaller carton.
- Motor and blade mounted on one bracket installs by merely tightening two wing nuts.
- All fans equipped with extra long "Break Off" bolts. Enables installer to compensate for wall or ceiling irregularities requiring longer or shorter bolt.
- Grills removable by merely unscrewing center grill knob—no tools required.
- 11 models to choose from.
- Full 5 year guarantee on all models.

FOR COMPLETE INFORMATION AND CATALOG WRITE TO

BERNS MFG. CORPORATION 3050 N. Rockwell St. • Chicago 18, III.



"KF" SERIES Wall switch or pull chain models. All models adjustable and are available for all wall thicknesses . . 590 C.F.M. or 800 C.F.M.



"WF" SERIES Economical models, fully automatic with wall switch control. "Flutter-free" counter balanced shutter in outside hood. Also available with pull chain. All models adjustable . . . available for all wall thicknesses. 475 C.F.M. or 600 C.F.M. at fan discharge.



"TC" SERIES Exhaust through coiling for truly economical installation. "Reducer" incorporates counter-balanced, automatic shutter. Adjusting hangers permit easy adjustment of housing to desired distance below joists. 525 C.F.M. or 750 C.F.M. at fam discharge.



Duplex Receptacle

(53)

Several room lights may be conveniently turned on or off at a single wall switch when they are connected to one of the outlets of a new duplex wall receptacle. The other outlet, constantly alive, provides current for appliances. This dual purpose unit employs two separate feeds and one return. Construction is high impact, high dielectric molded Bakelite, available in either brown or ivory. Unit fits standard boxes and wall plates. Outlets are T-slot in design to accept either plug style. Other features include solid brass terminals with screw heads large enough to hold two No. 10 wires; heavy, positive-grip, spring-bronze, double wiping contacts; side wiring and plaster ears. Rated for 15 amps at 120 volts, 10 amps at 250 volts. It is listed by Underwriters' Laboratories.

John I. Paulding, Inc., New Bedford, Mass.



Cabinet Drawer Oven

(54)

Model HBD oven is especially adapted to preheating and stress relief of small parts, for processing nylon powders and other processing up to 850°F. Special drawer construction which closes opening in cabinet when drawer is pulled out, permits insertion or removal of contents of one drawer while keeping temperature at maximum required in remainder of oven. Features include—uniform work chamber temperature; high volume adjustable air flow; high and low heat switch for close control and quick recovery; Inconel-sheathed "Life-time" heating elements; temperature control; manual interlock for purge period operation of blower without heat; electrical interlock for turn-off of heat in case of blower motor failure; adjustable positive exhaust and intake; belt driven fan. Size outside 34-in. wide, 28-in. deep, 54-in. high; 24 drawers 2-in. high by 12-in. wide by 26-in. deep.

Grieve-Henry Co., Inc., 1811 W. Lake St., Chicago 12, Illinois.



The Raco "Locator" device ring eliminates time wasted in finding and cleaning outlet boxes. It also does away with bits of plaster lodging in pipe and avoids cleaning operations before wiring. "Locator" positions over outlet box before plastering. After plastering, the raised section of the "Locator" remains in sight. A leverage hole in the embossment permits easy removal of knockout. It is available in two sizes, 1/2-in. and 3/4-in. All-Steel Equipment Inc., Aurora, Ill.



Torch

A new "Torch-O-Matic", pistol-shaped torch for soldering, burning, sweating and other jobs, is designed for use with propane gas. A squeeze of trigger produces a controlled flame—a fine pin-point or a full, six-inch flame, as desired for any job. It connects directly to propane tank. Among applications for which it is suited are soldering cable lugs, armatures, commutators and rotors, terminals, leads and bus bars, rebuilding motors, generators, transformers and unsoldering connections,

Velocity-Power Tool Company, 201 North Braddock Ave., Pittsburgh 8, Pa.



Tough fastening job made easy... costs reduced and time saved with high-speed Ramset System

Some 40,000 fastenings were required to install conduit and overhead lights in the warehouses of the Naval Air Station at Alameda, California.

Instead of welding or drilling holes for bolts, operators rolled along on movable platforms and anchored 3/8" steel angle plates with light, easy-to-use RAMSET JOBMASTERS and Tru-Set drive pins. Fixtures were then hauled up and fastened to the plates. Each bay of the 800-foot-long warehouse was completed in less than four days. The work was done far faster and at much lower cost than would have been possible

with conventional methods, and scaffolds were eliminated.

The speed, ease and economy of RAMSET SYSTEM "pays off" on almost any kind of anchoring into steel or concrete. Reducing time up to 90% and cutting costs up to 75% are day-by-day experiences of thousands of electrical contractors and maintenance men, many of whom have been profiting from RAMSET SYSTEM for five years or more.

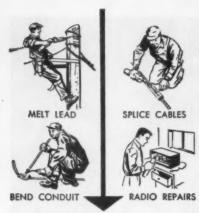
Ask your local dealer for onyour-job demonstration of profit-making RAMSET SYSTEM. or write us for details and new Specification Manual.

amset Fasteners, INC. Olin Industries, Inc. 12105 BEREA ROAD . CLEVELAND 11, OHIO

FIRST IN POWDER ACTUATED FASTENING







DO THESE AND MANY JOBS FASTER AND EASIER INSTANT LIGHTING

TORCHES WITH DISPOSABLE **FUEL CYLINDERS!**



MASTER—Is the ideal torch for linemen and contractors, for heavy duty day-to-day service.

Both torches are light in weight (MASTER, less than 3 lbs. BANTAM, less than 2 lbs.), compact and portable, fit neatly in tool box or pocket. Both have disposable cylinders containing enough fuel for hours of normal use. Burn at 2300° F. Catalog sheets give details. Mail the coupon for your copies today.



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Please send me ca Master and Banta		he Bernz-O-Matic
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Company	****	
Address		*************
ma.	7000	Chata



FHP Motors

(57)

An enlarged terminal box and improved brush mounting are features of G.E.'s line of 60- and 70-frame dc motors. Terminal box has been enlarged to six-lead capacity. Changing contour of commutator end-shield to accommodate larger, cast-in box has not altered motor's basic dimensions. For better ventilation and increased insulation life, a heavy duty, die-cast aluminum fan has been added. Suitable for general-purpose, constant-speed applications, the compound-wound motors also may be operated at variable speeds by derating, or reconnected for operation as a shunt motor, self- or separately-excited. With speeds of 1725, 1140, or 860 rpm, new motors are available in ratings of $\frac{1}{3}$ -, $\frac{1}{2}$ - and $\frac{3}{4}$ -hp and $\frac{115}{230}$ volts.

General Electric Co., Schenectady 5,



Switch

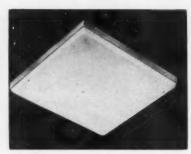
8-pole double throw switch gives positive control of 8 primary circuits. It may be applied to stop carriers; release machine loads; stop or start machines; to shut off boiler feeds; dump fuel or start extinguishers. Constant contact pressure is maintained throughout stroke until positive snap-action occurs in either direction. Contacts handle 5 amps 28 volts dc inductive; 10 amps, 115 volts ac non-inductive; 60 to 400 cycles. Designed for easy multiple wiring to each terminal. Unit mounts on 1½-in. by 1¼-in. panel area.

Guardian Electric Manufacturing Co.,

1621 W. Walnut St., Chicago, 12, Ill.

Lighting Fixture

A group of super-sized, rapid start lighting fixtures, providing panels of fully diffused illumination 16 feet square, has been added to this line. The 4-ft by 4-ft Optiplex units are for stores, offices, institutions and other commercial applica-



tions. Fixtures consist of a smooth, white, hinged diffuser of Plexiglas housed in a baked white, enameled, steel assembly. Lamps and chassis are enclosed. Destaticized to repel dust collection on its outside surfaces, the diffuser hinges down with finger-tip pressure for one-man cleaning and relamping. Designed for either six or eight 40-watt rapid start lamps, the Optiplex are available for stem, surface or recessed mounting.

Lightolier, Inc., 346 Claremont Ave., Jersey City 5, N. J.



Transformers

(60)

New Uni-Wound 3-phase distribution transformers, available in sizes 1121/2, 150, 225, 300, and 500 kva at standard distribution voltages through 14,400 volts. The core is physically and magnetically one unit. Round coils are wound onto each leg of the core. Advantages are excellent cooling, light weight, short-circuit strength, high impulse strength, and high short-time overload capacity.

Line Material Company, 700 W. Michigan St., Milwaukee 1, Wis.

Battery Charger (61)

Precision-charge line has been introduced with a charger for Edison industrial truck batteries. Three models are available to cover charging requirements for batteries of 10 to 42 cells. Model S9640 is designed for batteries of 10 to 15 cells that are used with the "walkietype" truck. Model S6088 is for 10 to 30 cell batteries for heavy-duty trucks of both the "walkie" and "rider" type of truck. Model S9607 charges nickel-ironalkaline batteries with 21 to 42 cells.



Cut fastering costs up to 80% on heating and air conditioning installations...with the REMINGTON STUD DRIVER

"It saves us money on every fixture we install"—that's the kind of report we're getting every day on the Remington Stud Driver. Big savings just naturally result from the amazing speed of this powder-actuated tool. It sets as many as 5 studs a minute in steel or concrete!

You'll find real economy, too, in the fact that the Stud Driver is completely self-powered—no need for extra equipment, wires or cables. Compact and portable, the tool is designed in every way for easy handling. And since it weighs only 6 pounds, it's ideal for working overhead and in confined spaces.

What's your fastening job? Whether it's fastening pipe to walls and ceilings or anchoring fixtures to concrete floors, you'll save money with the Remington Stud Driver. For complete information on how to cut your fastening costs, just send in the coupon below.

QUESTIONS YOU ARE ASKING

QUESTION:

What are the studs made of?

ANSWER:

Genuine Remington studs are made of a selected molybdenumbearing alloy steel, heat-treated for required hardness and ductility properties. All are plated for protection against corrosion.

"If it's Remington—It's Right!"





Listed & Approved by Underwriters' Laboratories, Inc.

MAIL THIS COUPON TODAY

Industrial Sales Division, Dept. E.C.M.-6 Remington Arms Company, Inc. Bridgeport 2, Connecticut

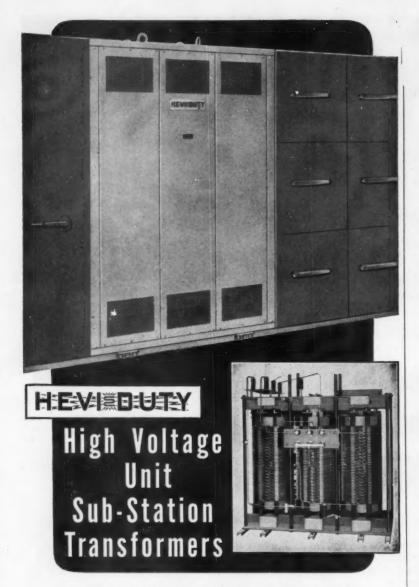
Please send me free copies of the new booklets showing how I can cut my fastening costs.

Name____

Position____

Address____

City_____State___



INCREASE EFFICIENCY OF LIGHTING AND POWER CIRCUITS BY SUPPLYING EQUIPMENT WITH THE CORRECT VOLTAGE

When you need electric power, you can count on Hevi Duty Dry Type Transformers for dependable service. These transformers are engineered to meet or exceed all the requirements necessary for long life.

Note the adequate core and coil blocking, high voltage insulators and well ventilated pancake type coils on the Type 31FH, 300 KVA, 13,200-208Y/120 volt, 60 cycle Transformer shown here.

Hevi Duty Dry Type Transformers can be supplied separately or as a Unit Sub-Station complete with primary and secondary switch gear according to your specifications.

Write for Bulletin HD-499.

HEVI DUTY ELECTRIC COMPANY

Heat Treating Furnaces... Electric Exclusively

Dry Type Transformers Constant Current Regulators



These batteries are for heavy-duty trucks for long hauls of heavy loads over long periods of time. Correct charging rate for any battery is set with a single charging current control. The only other control required for operation is time control. This automatically starts unit, connects battery to charging circuit and stops unit when battery is fully charged.

Lincoln Electric Co., Cleveland 17,



Clamp (62

A new line of "J" clips for installing tube, pipe, BX cable, conduit, Romex, etc. It is a single shank steel clamp or staple that holds a wide variety of tube or wire securely in any installation where the "J" clip can be driven into wood. There are 4 sizes available: one for ¼ in. through ¼ in. outside diameters; another for ¾ in. through ½ in., and a separate size each for ¾ in. and 1 in. Where BX cable is to be clamped, clips are supplied with gripping grooves on inner surface to prevent cable slippage. A choice of five plated finishes is offered: zinc, or galvanized, nickel, cadmium, copper and lustron.

Barton Staple Company, East Hampton. Conn.

(63)

Enclosed Cutout

A new PID (Porcelain Intermediate Duty) 100-ampere indicating cutout. The new 7.8-kv unit with a 4000-ampere interrupting capacity supplements the initial 5.2-kv PID cutout. The double-hinged flipper on PID cutouts assures positive link extraction during low fault currents and provides visible indication that cut-



out has operated. Switch blade doors are available to convert cutouts to 200-ampere disconnect switches.

Line Material Company, 700 W. Michigan St., Milwaukee 1, Wis.



Emergency Light

(64

This new low-cost automatic standby light conforms to the latest requirements of the National Fire Code and is UL approved. The glass jar (non-automotive type) battery in this unit is capable of delivering 91% of rated capacity after 30 minutes of use. Features include external switches for quick testing. Other switches control the battery charger and disconnect the lampheads should unit be taken out of service. A red pilot light indicates when battery is on high charge and an amber light indicates readiness for service. Leaflet B is available.

Carpenter Manufacturing Co., Boston 45, Somerville, Mass.

Face-and-Hand Dryer (65

New high speed, low cost Ozo-Dry Hurricane, electric hand-and-face dryer with germicidal action, for use commercially. Equipped with Westinghouse Odorout sterilamp, it provides a simultaneous drying and sterilizing operation. A 2000-watt heating unit, protected by a special

SYLVANIA ANNOUNCES-



The Fixture which Controls Sight and Sound!

New fluorescent lighting fixture[†] has built-in sound-conditioning system . . . easily installed!

Now Sylvania introduces SONO-LUME
. . . a new concept of sight and sound control!

Basically, Sono-Lume is an attractive fluorescent fixture incorporating principles worked out by Sylvania engineers.

The perforated wings on each side of Sono-Lume fixtures are backed with glass fiber batting. This element has the excellent noise reduction coefficient of 0.85. Thus the fixture serves a double

purpose: (1) It provides high levels of clear, soft, all-over illumination for comfortable seeing. (2) It holds unnecessary noise to low levels for comfortable hearing.

Saves modernization costs! Sylvania Sono-Lume fixtures can be readily installed in any office, conference or consultation room. In instances where sound-proofing and better lighting are separate projects, this new combination fixture keeps costs well within modest budgets. A note on your letter-head will bring you detailed information. Simply address Dept. 4X-2406, at Sylvania.

*Sylvania Trade Mark *Patent Pending



SYLVANA

Sylvania Electric Products Inc., 1740 Broadway, New York 19, N. Y.

In Canada: Sylvania Electric (Canada) Ltd., University Tower Bldg., St. Catherine Street, Montreal, P. Q.

LIGHTING . RADIO . ELECTRONICS . TELEVISION



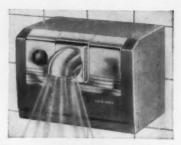
Sales for this protective reflector come from sources where protection is required for high bay reflector lamps against breakage and water damage.

The reflector lamps have a built-in silver reflector permanently protected from accumulation of dust. Lower part of bulb has a lightly frosted surface to reduce glare.

The Protective Reflector is of sturdy steel construction—finished throughout in permanent porcelain enamel—the exterior is standard reflector green—the inside is finished in reflecting white. Made in solid neck socket-reflector style as shown or equipped with QD interchangeable Socket-fitting for mounting on vertical or horizontal pipe supports. Has keyhole slots for easy attachment, removal, or interchange of styles.



QUADRANGLE MFG. CO.



fuse, and 6000 rpm blower assure under 30-seconds drying speed. The wall unit measures 9½-in. by 7-in. by 6¾-in. It is equipped with a large pushbutton timer and chrome-plated nozzle of swivel design. Michael Electric Company, Inc., 15 Stiles St., New Haven, Conn.



Scaffold

(66)

A new midget rolling scaffold, 4 feet long and 4 feet high, is 23½ inches wide. Rungs are spaced 6 inches apart. It comes equipped with two 2 by 6 planks and one 2 by 10 plank. At the higher levels, the 2 by 6 planks are used as steps, permitting worker to walk up and down as on a step ladder. All-welded steel construction.

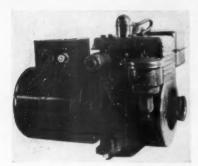
Superior Scaffold Company, 5624 Bankfield Ave., Culver City, Calif. and National Plaster Block Company, 2236 N. 27th St., Philadelphia 32, Pa.

Electronic Air Cleaners (67)

Electronic air cleaners, called "Electroair" are compact units for homes and smaller commercial and industrial building areas. It can be installed easily in the forced air ventilating system of almost any new or old home or building area. The new equipment is built on a simple principle. Dirty air is pulled through an ionizing screen where particles as small as 1/1000 of a micron receive a positive electrical charge. Particles then pass to collecting plates to which they adhere. Clean air is then ready for circulation

throughout the rooms of a home or building. Collecting plates are periodically sprayed by water and flushed free of contamination. An Electro-air power pack with selenium rectifiers is housed separately from the collecting cell and is furnished with brackets so that it is mounted easily on the unit. Unit accommodates air from either right or left. Vertical flow units are furnished with legs and no suspension nuts. Horizontal flow units are shipped for suspension and legs are furnished if desired.

Electro-air Cleaner Company, 1285 Reedsdale St., Pittsburgh 33, Pa.



Electric Plants

(68)

A new series of 400-watt electric plants, designated models 08-B and 08-ES, for heavy duty service. Generator on plant is a four-pole type and has a capacity of 400 to 450 watts, 110-120-volt, ac. Weight is 78 pounds, making it suitable for portable service in addition to stationary mounting. A convenient plug-in receptacle is provided on housing on top of generator for floodlighting service and for taking out current to operate tools, machines, and equipment. Length is 17½-in. and width 14½ in. Unit is self-contained and includes gas tank, muffler and air cleaner. Bulletin DZE-1 is available.

Universal Motor Company, 522 Universal Drive, Oshkosh, Wis.



Lighting Unit

(69)

New Nicad emergency lighting unit, designed to provide an auxiliary 6-volt light source which will come on automatically when the normal ac supply fails. Heart of unit is Nicad steel encased alkaline storage battery. Mounted on top of unit are two 6-volt lamp heads and reflectors. Front panel mounting includes a high-rate charge timer that can be set from 0 to 12 hours, an amber neon light, a red neon "high rate" light, a 6-volt



Costs and tempers go down when you use the world's

handiest benders!



Here's a happy electrician! His handy, portable Blackhawk Bender permits bench-top as well as floor operation ... makes kinkless bends, matched offsets and rigid installations easy.



HANDIEST ...

because the Blackhawk
"Porto-Power" remotelycontrolled bydraulic jacoperates in any position
on its side or upright
, whichever way it's
easiest to measure the bend.

HANDIEST ...

because it's really portable. You can use it on the floor on the bench or overhead on existing pipe runs. And — it's easy to soll or carry to the job.

HANDIEST ...

because you can simultaneously pump and sight the job from any angle assure better bends. Can be hand operated or motor driven.



LOW COST

Example: The S-30A kit for bending 1 to 2" rigid conduit contains powerful "Porto-Power" hydraulic jack and 9 bending attachments ... costs only \$135.45

Price subject to change without notice

BENDERS FOR ALL WORK — For thinwall or conduit up to '" — Blackhawk Benders pay for themselves in a hurry. Order from leading supply houses or write for catalog 50-B. Blackhawk Mfg. Co., Dpt. J-2064 Milwaukee I, Wisconsin.

BLACKHAWK

light switch and a pushbutton test switch. A removable sub-assembly carries the transformer, rectifier, cut-over relay, timer, trickle-charge resistor and all other components.

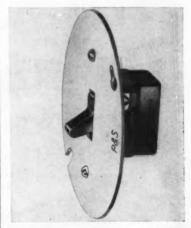
Nickel Cadmium Battery Corporation, Easthampton, Mass.



Spot Concrete Insert

Adaptable to a variety of hanger sizes, spot concrete insert provides an easy method for hanging piping, electrical conduit, heating and ventilating ducts, etc. Model No. P-3245 has V-slot for quick centering; holes for nailing into wood form; slot takes square or hex head nut, bolt or hanger up to ½-in. and centered holes for reinforcing rod. Bulletin No. S1-1 is available.

Unistrut Products Company, 1013 W. Washington Blvd., Chicago 7, Ill.



Switches

A new line of 10-amp T-rated box cover switches. They feature torsionally preloaded contacts; positive kick-off; give exceptional performance on type C lamp loads. Bodies are totally enclosed. Binding screws are large. Single pole and three-way switches are available on 31/4-in. and 4-in. covers having baked-on aluminum finish. Approved by UL.

Pass & Seymour, Inc., Syracuse 9,

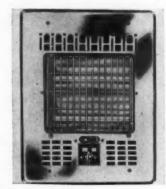


Transformers

(72)

A new line of power transformers with ratings from ½ kva up to 100 kva. These units are of the open dry-type design and are available in single-phase three-phase ratings. Transformers are designed for industrial applications such as power supply units, utility service, etc., and feature conservative design in accordance with AIEE, NEMA and ASA specifications. Catalog sheet is available.

Perkin Engineering Corp., 345 Kansas St., El Segundo, Calif.



Radiant Heater

(73)

A new automatic bathroom radiant wall Heetaire with a built-in thermostat. It produces warm comfort and maintains that comfort zone temperature automatically. It turns itself off and on as needed to maintain the temperature selected from 40° to 85°F. The Neo-Glo elements in the Heetaires are glowing bars that produce radiant heat—infrared rays—with equal intensity at all points. Size of front is 17¾-in. high by 12¾-in wide. Size of box is 13¾-in high by 10½-in wide by 3¾-in, deep. Approved by UL.

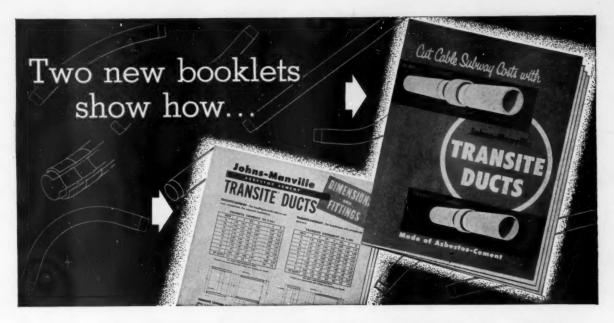
wide by 3¾-in. deep. Approved by UL.

Murkel Electric Products, Inc., and
LaSalle Products, Inc., Buffalo 3, N. Y.

Level Control

(74)

Level control Type 13DJ3 controls the level of all electrically conductive liquids. It consists of an electron tube amplifier and relay combination which operates from minute currents in the probe circuit.



Transite® Ducts cut cable subway costs-



Transite Conduit is the thicker walled duct which is used for exposed work or is laid directly in earth without a concrete encasement. Saves time, labor and materials on the job



Transite Korduct® is the thinner walled duct for installation in concrete. Inasmuch as it is used principally for hivoltage lines, its high thermal conductivity reduces operating losses.

give greater cable protection

• Johns-Manville presents these brochures as a service to public utilities, design engineers, and all other users and planners of cable subway systems. "Transite Ducts" shows how improved cable subway protection, installation, maintenance and operational savings may be achieved. "Transite Ducts, Dimensions and Fittings" give the necessary dimensional data on all ducts and fittings.

Transite Ducts offer improved cable subway protection. Made of asbestos and cement, Transite cannot burn, smoke, fume or generate explosive gases. Transite confines arc damage and protects adjacent cables against heat and flame. Transite resists corrosive action of soils; is unaffected by electrolysis.

Installation savings result because Transite is strong, light in weight, easy to handle. It comes in long, 10foot sections, thus, fewer joints are required. Its permanently smooth bore prevents injury to cable either from natural movement or when pulling cable through. Maintenance savings result from the permanent nature of the asbestos cement composition of Transite. It is as durable as stone.

Moreover, operational savings result because cables run cooler due to the high thermal conductivity of Transite Ducts. This also results in prolonged cable insulation life.

For complete details on how Transite Ducts can cut cable subway costs for your system, send for copies of "Transite Ducts," EL-29A and "Dimensions and Fittings," EL-45A. Write to Johns-Manville, Box 60, New York 16, New York. In Canada, 199 Bay Street, Toronto 1, Ontario.



Johns-Manville TRANSITE DUCTS

TRANSITE KORDUCT—for

TRANSITE CONDUIT—for exposed work and installation underground without a concrete encasement

C-O-O-I OPERATION through SCREEN VENTING

Yes, cooler, safer and more trouble-free operation — longer and better protection — with Pierce Fuses! Their venting permits free flow of air through the interior — keeps fuses 10 to 40% cooler — prevents afterblow by permitting dangerous gases and pressures to vent if a link lets go to protect equipment.

Pierce quality is recognized. Their tubular bridge, for instance, assures continually correct knife blade alignment and perfect clip contact. Cases last 6 to 8 times longer. All Pierce quality Fuses are equipped with the famous Balanced Lag Links. Yes, Pierce offers you fuse protection that is unequaled.

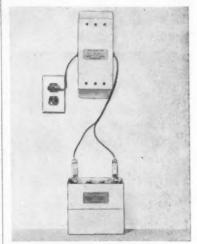




Contact with the liquid is made only by corrosion-resistant stainless steel probe rods. A single control, through flexible terminal panel connections, provides for operation as either a pump-up or pump-down control, or a high or low level safeguard with fail-safe action for all five types of operation. The control is universal for either 115 or 230 volts 50/60 cycle supply. Bulletin PF 544 is available.

Photoswitch Incorpoated, 77 Broadway, Cambridge 42, Mass.

(75)



CHARGER (Model BC-1) designed for single battery charging of nickel cadmium batteries which are provided with Dual-Lite handlights. Proper connections are made to the battery, and the ac cord can be plugged into any standard 115-volt, 60-cycle ac outlet. The charge rate is maintained for eight hours. Dual-Lite Co., 186 Front St., Bridgeport 6, Conn.

Product Briefs

(76) Dryomatic Corporation of Alexandria, Va., has announced a new electric steam generator. . . . (77) Merix Chemical Company, Chicago, Ill., has developed Anti-Static No. 70 which destaticizes and prevents static-caused dust and dirt on plastics and No. 79-OL which destaticizes fabrics.

(78) Air-flow drying tunnel kits incorporating Chromalox electric far-infrared heaters are now available from Edwin L. Wiegand Company, Pitts-

It Pays YOU

It Pays YOUR CUSTOMERS





(Also a complete line of quality non-renewable fuses.)

WRITE TODAY for this helpful booklet on fuses that positively avoid afterblow.

PIERCE RENEWABLE FUSES, INC.

burgh, Pa. . . . (79) Trico Fuse Mfg. Co., Milwaukee, Wis., has announced a new line of fuse reducers that make it possible to use standard or dual-element cartridge fuses of sizes smaller than the fuse clips are intended for and for proper fusing of two phase, 3-wire circuits. . . . (80) Taper-Lock roller chain sprockets in both single and double hub types are now available in an expanded line of stock sizes from Morse Chain Co., Detroit, Mich.

(81) A new type of storage battery for electric industrial trucks has been announced by the Edison Storage Battery Division of Thomas A. Edison, Inc., West Orange, N. J. . . . (82) Four Wheel Drive Auto Company, Clintonville, Wis., has developed the Eagle P-M (pole moving) safety bar. ... (83) New heavy duty brown Bakelite cord connectors and caps available from Gem Electric Mfg. Co., Inc., Brooklyn, N. Y.

(84) Made with a new built-in folding tool tray, the new Ridgid 40-tristand pipe vise has been announced by the Ridge Tool Company, Elyria, Ohio. . (85) A complete line of new, flexible, loop-type cable clamps made of laminated fiber glass cloth and polyester resins has been introduced by the LeConte Plastics Co., Inc., Farmingdale, N. Y. . . . (86) Anaconda Wire & Cable Co., New York, N. Y. has announced that Hy-Therm copper conductors, which had been in limited supply due to restrictions imposed by copper allocations, are now available.

(87) Radio Specialty Manufacturing Portland, Ore., has developed portable communication units, known as "Minipak". . . . (88) Techniflex Corp., Port Jervis, N. Y., has announced the development of a line of "Zero-Plugging Control Systems" for the fast stopping of electric motor driven equipment. . . . (89) A redesigned 2-pole, 60-cycle, 3600-rpm squirrel cage motor in ratings of 900 hp and larger has been announced by Allis-Chalmers Mfg. Co., Milwaukee, Wis.

(90) Metron Instrument Co., Denver, Colo., has announced a new three-inone hand tachometer. . . . (91) Bennett Manufacturing Co., Alden, N. Y., has announced the new "His and Hers" double sliding mirror doors fluorescent lighted and unlighted medicine cabinet models. . . . (92) Farrelloy Company, Philadelphia, Pa. has developed No. 8 non-corrosive flux for use on copper, brass, terne plate, tin plate, etc.

(93) New lantern 'Lektrokutor kills flies, roaches, spiders, silverfish, moth and is made by the Aaron Insect 'Lektrokutor Co., Los Angeles, Calif. . (94) Pressure Can Corporation, Edgerton, Wis., has announced a new automatic torch called "Insta-Lite". . . . (95) The Elwood Co., Buffalo, N. Y., has introduced a new voltage

(96)

Remington Corp., Auburn, N. Y., has incorporated as standard equipment into its 1/2 hp deluxe window air conditioners, an Air Fresh'ner device containing chlorophyll.



Make Installations EASIER, FA with these TIME-SAV

NOW you can obtain ALL IN ONE PACKAGE all needed fittings for quick, complete entrance mast installations. Including (A) 11/4" Service Entrance Head, (B) Threadless Top Fitting 2" or 21/2" to 11/4", (C) Heavy Duty Mal. Iron H. D. G. Ins. Bracket, (D) 2" or 21/2" One Hole Strap, (E) Threadless Bottom Fitting for inside of 2" or 21/2" conduit or pipe to 1" or 11/4". The one-bolt Insulator Bracket made of galvanized malleable iron. Insulators feature wet process porcelain spools with 1/2" pin and brass cotter. For fast, time-saving installations, order these M&W Kits:

FOR 2" Pipe or Conduit SM-200 Kit Consists of 11/4" Entrance Head, Pole Top Fitting, 3 Pipe Straps and Pole Bottom Fitting with 11/4" to

SM-200-I Kit. Same as above except also includes three Insulator Brackets.

FOR 21/2" Pipe or Conduit SM-250 Kit Consists of 11/4" Entrance Head, Pole Top Fitting, 3 Pipe Straps and Pole Bottom Fitting with 11/4" to 1" reducer.

SM-250-1 Kit. Same as above except also includes three Insulator Brackets.

All parts furnished in kit form or separately. Ready for immediate delivery. See your jobber or write for 1954 Catalog.

MANUFACTURERS OF WATERTIGHT SERVICE ENTRANCE CONNECTORS -GROUND CLAMPS & RODS - BX-ROMEX CONNECTORS - WIRE HOLDERS -SERVICE ENTRANCE FITTINGS — CONDUIT HANGERS & INSULATOR SUPPORTS.





ONLY ONE SETUP IS NEEDED!

PUSHES 45 Ft. of fish tape per min.

PUSHES around five 90° bends.

STOPS automatically if obstructed.

PUSHES 175 Ft. of .060″ x ¼″ usable highest quality tape.

MAY BE USED in any position.
ANDICATOR shows how many feet of tape is pushed into conduit.

PULLS 17 Ft. per minute, full load.

PULLS 1200 Lbs. (equals pull of 8 men).

PULLS wire in 34" to 2" conduit.

OPERATES on 115 Volt AC or DC Current.

RUGGED, Heavy Duty Construction.

SAFE! The fish tape is always in the conduit or in the tool . . never free to come in contact with moving machinery, bus bars, live wires, etc.

+ + +

AVAILABLE General Electric Supply Co.
THRU YOUR Grayber Electric Co.
Westinghouse Electric Supply Co.
The BARTH
CORPORATION

12652 BROOKPARK RD., CLEVELAND 29. O.

CATALOGS and BULLETINS

(97) Magnetic Relays, both open and hermetically sealed ac and dc types, are briefly listed in a 4-page reference giving basic electrical and physical characteristics. Bulletin 560A. R-B-M Div. Essex Wire Corp.

(98) Panelboard planning booklet describes advantages of De-ion circuit breakers and the dead-front panel to user and contractor; lists available panel equipment; includes new brief form for panel specifications. B-6098, 16 pages. Westinghouse Electric Corp. (99) Wires And Cables for every type of installation are described in detail in a 140-page reference book prepared by the Electrical Wire and Cable Dept. of U. S. Rubber Co.

(100) CONTROL INSTRUMENTS. 4 catalogs. Bulletin 6340 describes the Brown dual temperature controller. Flow meters for various control uses are listed in 56-page 2320. Bulletin 9050 covers instrumentation for steam generation in 28 pages. 5001 is a composite listing of industrial controllers and suggested applications; 24 pages. Minneapolis-Honeywell Regulator Co., Industrial Div.

(101) ELECTRIC HEATERS and control equipment for industrial applications; 23-page booklet lists wattages, supply voltage and dimensions; instructions for selecting the right unit for any job. B-6161. Westinghouse Electric Corp. (102) MECHANICAL INSTRUMENTS including temperature and pressure recorders, controllers, various thermometers, diaphragm motor valves and accessories are described in catalog M-2-A. Weston Electrical Instrument Corp.

(103) MOTOR SELECTOR for squirrel cage induction motors from 1 to 200 hp gives complete data needed to choose the right motor. 12- page bulletin B-2102. Reliance Electric & Engineering Co.

(104) AIR CLEANERS for home and smaller commercial and industrial areas. 8-page booklet describes operation and capacities of the several units. Electro-air Cleaner Co.

(105) LIGHTING FIXTURES. 48-page catalog includes units designed for tunnels, stations and toll booths as well as complete line of quality fluorescent and incandescent luminaires particularly suited for institutional or commercial installation. Simes Co., Inc.

(106) Stud Welder. Revised manual lists models and their performance capabilities. Parts and utilization data are included, also service directory. 46 pages. Nelson Stud Welding Div., Gregory Industries, Inc.

(107) OUTDOOR METERING outfits combine potential and current transformers in one tank. Type MP units available in three phase to 115 kv and single phase to 161 kv. B-5916. Westinghouse Electric Corp.

(108) SWITCHGEAR AND CIRCUIT BREAKERS. 3 bulletins. 7004-B has sections on applications, specifications and construction of high voltage switchgear. 6004-A, also 24 pages, covers low voltage switchgear. Air circuit breakers called "Urelite" are covered in 4 pages of figures, features and photographs in bulletin 5107-DR-1 which includes data on weatherproof and dust-tight enclosures. I-T-E Circuit Breaker Co.

(109) PORTABLE OUTDOOR LIGHTING for gardens and play areas. 4-page folio 135-54. Steber Manufacturing Co.

(110) Drive Systems for textile machinery is discussed in two new bulletins. GEA-5993, 8 pages, covers adjustable-frequency systems for synthetic fiber production. 4-page GEA-5258A concerns adjustable-speed warper drives. General Electric Co.

(111) INSULATING VARNISH catalog lists all available types; application techniques and utilization data is included. Irvington Varnish & Insulator Div., Minnesota Mining & Mfg. Co.

(112) Ballast Sound Ratings and other factors affecting operating noise levels are discussed in 4-page bulletin GEA-5672B. General Electric Co.

(113) Power Regulators. 3 booklets. Basic data on step and induction voltage regulators and units available are covered in B-6053, 20 pages. Use of voltage regulators on rural lines is the subject of 20-page B-6054. Current-limiting reactors for industial circuits provide cost saving in two ways described in B-5918. Westinghouse Electric Corp.

(114) TAP CONNECTORS may be used with any combination of conductors-copper, aluminum or ACSR. Available in three sizes. Section K-1, 4 pages. Ideal Industries, Inc.

(115) SWITCHGEAR. 36-page bulletin 200 includes complete specifications for laying out low voltage switching centers. Continental Electric Equipment Co.

(116) BATTERY MAINTENANCE is broken down into seven basic rules in this pocket-sized 8-page booklet. Form 5063. Electric Storage Battery Co., Exide Industrial Div.

BULLETIN 849 TIMING RELAY CONSISTS OF TWO UNITS

The solenoid operating unit and the pneumatic timing unit are mounted on a steel backplate.



ON-DELAY OR OFF-DELAY

The timer may be arranged for ON-Delay or OFF-Delay. ON-Delay provides time delay when solenoid is energized; OFF-Delay provides time delay when solenoid is de-energized.



HORIZONTAL CONSTRUCTION

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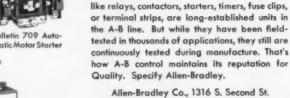
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Reader's Quiz

Insulation Resistance Testers

QUESTION R25—We consistently experience trouble from our two insulation resistance testers on high voltage work, 2400-volt and over. We have two different makes, and both units produce a 500 volt dc signal through practically identical megohm meters. On lower voltage, 110 to 480 volts, tests are conclusive. However, on high voltage, we secure "good" readings, place the equipment in service and it will invariably "go to ground."

Do any readers have experience along these lines, and what has been

their solution?-L.W.F.

ANSWER TO R25-During the past year I had occasion to make a study of insulation testing and write a set of test specifications. I am now working as a Project Engineer in charge of testing and acceptance. It appears to me that your trouble lies in instrument application. With a Megger that does not have a high enough output voltage for the equipment being tested, the insulation will test much higher than with a high voltage Megger. This is due to a phenomenon called "endosmosis." It was originally observed about 35 years ago by S. Evershed and is sometimes called the "Evershed Effect." Regardless of what name you call it, when this condition occurs your insulation has moisture in it and needs a good drying out. You might say that the higher voltage does a better job of "sniffing out" the moisture in the insulation.

If you have sufficient high voltage testing to warrant it, I would suggest you purchase a Megger with a 2500 volt, dc output voltage. In the meantime, you can use your present Meggers for approximate results by multiplying the results on high voltage equipment by approximately 0.60.

In general, readings of insulation resistance should be considered as "relative." These readings should be compared with past test results. Megger readings which are much lower than previous test results indicate the insulation is going bad.

For comparable results, be sure to check your Megger instruction book and correct your insulation resistance readings to normal room temperature (about 70 deg. F.). At extremely low

temperatures, insulation can test as much as four times as high as it will at room temperature.—C.H.McC.

ANSWER TO R25—The trouble described is always cropping up. I have had the same experience with 500 volt megohmmeter on 2400 volt equipment. About the only answer is—misapplication of equipment. The best solution is to construct a tester or purchase a commercial one that is capable of applying a voltage corresponding that of the insulation design voltage of your equipment.

In practice I have found that the Megger test is never conclusive. Experience has shown it not infallible on 480 volts. This is explained in this manner: The 480 volt ac is the RMS value or .707 of the peak voltage of a sine wave. The peak voltage of this circuit would therefore be approximately 678 volts and this extra 178 volts is capable of jumping an air gap to produce a short circuit that the Megger will not foretell.

Another condition that enters in is a loose connection or a switch or contact that may produce a small arc which creates ionized gas, which with proper conditions can cause a short circuit. After this has happened a megohm test may show even infinity, but the next arc will cause the equipment to again short out.

The 500 volt megohmmeter is a good instrument and is very valuable when properly used but we must remember that it has its limitations and must govern ourselves accordingly.

In general it may be found that the megohmmeter is not used often enough nor preventive maintenance followed strictly enough to prevent such unexpected failures from happening.—C.H.Z.

Increased Starting Torque

QUESTION \$25—We have a \{-hp\) capacitor-start 115-volt single phase motor that is used to operate a small air compressor. The motor has a hard time starting the compressor but once it comes up to speed it works fine. Can we change the condensor to increase the starting torque without harming the motor, and if so, how?—H.G.C.

ANSWER TO S25—We solved this heavy load starting problem by changing the motor pulley to a centrifugal type pulley. These start as if they had no load and automatically expand the clutch lining, thus the motor has gained speed and the torque is greater.

The shaft may need to be bushed up to a larger size and the new pulley may need to be replaced. We drilled and tapped the motor pulley and used screws to secure it to the new clutch.

—W.R.McM.

ANSWER TO S25-A larger condenser can be used with this motor to get more starting torque, since a larger capacitance in series with the starting winding has two effects: It increases the current through the starting winding, and also increases the phase angle between starting winding and running winding. However, since the starting winding and the contacts for opening the starting circuit were designed for the original current, an increase in maintenance might be expected. In general, this would be permissible if the starting duty is not too frequent.-E.A.McF.

ANSWER TO S25—The characteristics of a motor for maximum torque, rated current, rated voltage and all other factors are determined by the design of the motor. Any deviation from the standard has an effect on the motor in that it either causes excessive wear and strain or it does not accomplish the desired effect.

A higher rated condenser can be tried for your particular problem by simply discharging the old one and replacing it with the new using the same type of connections. However I doubt very much whether your problem will be answered sufficiently.

Your most efficient and practical answer would be to replace the motor with one of higher rating in the capacitor start class since a high starting torque is inherent in this class of motors, which is your prime requisite.

—J.B.K.

Oil Burner Installation

QUESTION T25—I was told that an explosion would occur if the ignition should fail before the boiler parts cooled on a gun type oil burner in-



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stallation. Will the stack switch protect against this type of explosion?—H.S.

ANSWER TO T25-The stack switch will normally offer protection against this type of explosion, however, it being a thermal device, it has an inherent time delay before it shuts off the oil supply. Some insurance companies are insisting on "fire-eye" equipment as a more direct acting, faster protection. If the furnace volume is known, and the maximum rate of furnishing oil is known along with the time required for the stack switch to operate, the vapor concentration in the boiler during the worst condition of flame failure is known. If this concentration exceeds about 25% of lower explosive limit, then finer protection than a stack switch is required.

ANSWER TO T25—All stack switches (primary controls) used as part of standard gun type burner installations are designed to lock out on ignition failure. If ignition failure occurs when burner starts, the burner will run a predetermined length of time before locking out. The length of operating time with ignition off depends on make of control. Some manufacturers' controls operate up to 90 seconds before lockout occurs, others lock out after several seconds.

If your ignition should fail on starting and your boiler parts are still hot enough to turn the fuel to gas, an explosion could occur.

Some burners are designed to operate on continuous ignition. If ignition should fail during starting, lockout will occur, time depending on make of control. If ignition fails during operation of burner, it will continue as usual until shut off by thermostat or other control means. When burner starts again if ignition still fails, lockout will occur after predetermined time.

While your burner is in operation, should a flame failure occur, fuel will continue to be pumped into the boiler until the temperature on the helix in the stack switch has dropped enough to open the contacts. On the average installation this drop will occur in 12 to 15 seconds. During this time fuel is pumped into the boiler and an explosion could occur.

Some manufacturers of primary control make a flame detector. The flame from the combustion chamber, acting on an electric eye, holds the contacts closed in the control. Immediately on flame failure the detector shuts off the burner. The control will recycle after a temperature drop takes place in the combustion chamber.

If your system has been installed

by a competent firm your chances of an explosion are very small, as the firm will select a primary control best suited to your boiler. The control will not continue operation after flame failure for a long enough period to allow a dangerous concentration of gases to build up in the combustion chamber.—A.E.

Meters

QUESTION U25—On Leland explosion-proof gasoline pump motors, the armature winding has jumpers across the commutator, which makes it show up on the growler test as a shorted winding. How would one know if this type of winding is used on other makes of motors being checked?—E.H.

ANSWER TO U25—The "jumpers" across the back of the commutator on the Leland motor you mentioned are for the purpose of connecting the sides of the commutator opposite the brushes to the brushes.

The armature is a 4-pole lap winding and therefore would require four brushes if without the "jumpers." With the "jumpers" only two brushes are necessary since the "jumpers" connect the bars in contact with the two brushes to the bars diametrically opposite across the commutator that would otherwise require two more brushes.

These "jumpers" are also used as equalizers on some motors. They reduce sparking at the commutator in cases of uneven magnetic flux around the stator due to uneven air gap, worn bearings, etc.

The "jumpers" or equalizers are used only on lap windings of four or more poles. They will cause an armature to show "shorted out" completely on a growler and can not be successfully tested with headphones.

The best method of testing is to remove the brushes and connect the motor to normal line voltage. If the armature can be turned freely and evenly the winding is clear. If it has a tendency to stick or lock in certain positions the winding is shorted.

If the armature tests "shorted" and is held in a position from which it tries to turn, the shorted coil or coils will heat considerably faster than the clear coils and can thereby be located.

Delco and Leland motors principally are equipped with equalizers or "jumpers." However any lap connected armature of four or more poles and mith an even number of wires per bar is likely to contain "jumpers" or equalizers.—J.A.

ANSWER TO U25—Leland gas pump motors have four pole lap wound armatures (with 1 and 2 connection)



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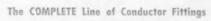
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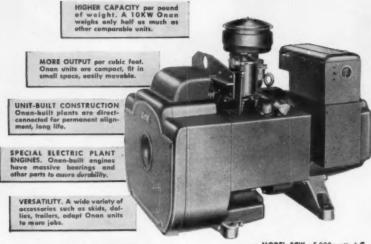


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MODEL SDRP—5KW A.C. Diesel two-cylinder air-cooled.



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Write for specifications and descriptive folder!



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which necessitates the use of cross connections in this particular type motor because only two brushes are used, though cross connections are used for various reasons on four pole lap wound armatures with four brushes, particularly Delco.

Any armature, which has cross connections, will on a growler, give a "buzz" at every slot, whether shorts are present or not. The simplest test for shorts in this, or any type single phase wound armature, is to remove the brushes from the commutator, preferably with the motor assembled, apply normal voltage to the motor, and with no belt or load connected to the armature shaft, turn the shaft with the hand. If the rotor is not shorted, it can be turned freely. If we connect an ammeter or a wattmeter in the motor circuit, the reading of the wattmeter will be about 10% of full load watts, and the ammeter reading will be from about 20% to 50% of full load amperes, and as we turn the rotor shaft, there will be no variations in either meter reading.

If the rotor is shorted, it will resist efforts to turn it freely. With the current on, it will tend to hang in certain definite spots. And as we force the rotor past these hanging points, the readings of the ammeter and wattmeter will vary.

If we have an armature to test and do not have its stator, we can use the growler for testing by placing preferably a wattmeter in the growler circuit. If the rotor is not shorted, the wattmeter reading will not vary as the growler is rotated. It will vary if the rotor is shorted. If shorted, and we move the rotor to the position which gives the highest reading, the maximum current will be generated in the shorted coils, and they can sometimes be located by the heat generated.

—H.D.

Grounding

QUESTION V25—I am installing a 100 amp service on a yard pole. When installing a service and panel inside, the Code requires them to be bonded. Would a ground electrode at the panel and at the outside service serve the same purpose?—L.R.L.

ANSWER TO V25—On a pole or inside of a building we still have to use a ground that the district inspector will approve, and we must bond all parts together.—H.S.

ANSWER TO V25—The service and panel in question should be bonded to the water system where practicable with a conductor of suitable current

carrying capacity and approved pressure connectors, lugs or clamps without use of soldered connections.

It is possible though to use made electrodes of some corrosion resistant material by drawing them into the ground. However the resistance to ground must be measured and read below 25 ohms. If at all possible, it should read around one ohm, which is the standard for most water systems and power company systems. Several electrodes in parallel might be used to obtain a desirable value.

However it is recommended you contact your local inspector and local building code for required grounding in your area.—J.B.K.

Three-Phase Motors

QUESTION W25—Is there any possible way of using some combination of transformers and condensers to satisfactorily operate three phase motors from a single phase source?—H.G.C.

ANSWER TO W25—Yes there is. There is a converter made by ILG Electric Ventilating Company, Chicago, Ill.—W.W.R.

ANSWER TO W25—Such a device as you suggest is not only possible but practical to a certain extent, and is recommended under certain conditions.

Phase converters from ½ to 15 horsepower are manufactured by the Henry Electric Company, Saginaw, Michigan and are available through many supply organizations.

The company requests complete nameplate data of the motor to be used and driven-load characteristics be furnished with orders to prevent misapplication. This of course is good business but I believe mainly requested so that the right size be selected. A Y-connected motor usually requires a unit of greater capacity than that of a delta connected motor to prevent shifting of the neutral. This reasoning is fairly easy but may be proved by vector analysis.—C.H.Z.

ANSWER TO W25-There is no possible way to operate three phase motors satisfactorily from a single phase source using condensers, resistors, reactors, and transformers. Naturally, phase shifting networks using simple lumped parameters are feasible, although not economical, for a given particular steady state power load, but this situation never exists in the case of a motor. For example, the conditions during starting and running are drastically removed from each other. The problem is strictly academic, since no practical solution exists.-J.S.





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Can you ANSWER these QUESTIONS?

QUESTION H26—Can rapid-start fluorescent tubes be used in an instant-start fluorescent fixture? Tubes to be used would be of same length and wattage.—E.S.H.

QUESTION J26—A manufacturing plant has a room that was designed and laid out as explosion-proof. All the motors, conduit, and fittings are of the explosion-proof type. One fault with the room design is that a fire door was installed giving access to the rest of the plant and it is usually kept open.

Now the company wishes to install three motors which are not explosionproof. They claim that no mixture will be made that gives off an explosive gas.

How can this be determined and what should be done about it?—G.J.

QUESTION K26—A 3-phase ungrounded system has an arcing ground on one phase. How does this arcing ground increase the voltage to ground on the other two phase wires? Does this sometimes change the frequency of the voltage to ground? Does the capacitance of the circuit affect the voltage rise?—M.D.

QUESTION L26—I would like to know how to figure the current in each of the conductors of a 3-phase load connected open delta. First, a range was rated 22 kw, 3-phase, 220 volts. It was connected to a 120/208-volt system, without connecting the neutral. One fuse kept blowing. Someone said the range was connected open delta and would need a larger fuse because the currents were not balanced.

Recently, a bank of two single phase 480-240-volt transformers were connected open delta and essentially the same thing happened, but by the past experience a larger fuse was put in the one line to which both transformers were connected. Transformers were connected 480 volts on the primary and were each of 15 kva capacity. They were connected to resistance loads so power factor was not involved.

Will some reader kindly explain how the various currents are connected? Also, should a power factor of less than 1.0 be encountered in the load, how would the primary currents and secondary currents be figured?—L.R.B.

PLEASE SEND IN
YOUR ANSWERS BY JULY 15

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Questions on the Code

Answered by

B. A. McDONALD, New York Board of Fire Underwriters, Rochester, N. Y.

GLENN ROWELL, Electrical Engineer, Fire Underwriters Inspection Bureau, Minneapolis, Minn.

B. Z. SEGALL, Consulting Electrical Engineer, New Orleans, La.

Fittings In Conduit

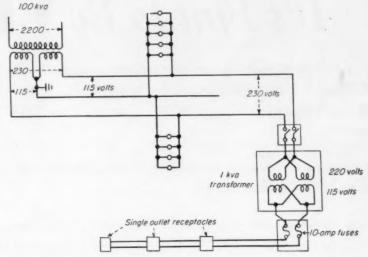
Q. If a conduit run from a filling station to a lighting standard passes through the pump island, is it necessary to place sealing fittings in this conduit even though the conduit is not open under the pump island?—D.R.

Yes. The Code is very specific in stating that an area within 18 inches of a gasoline dispensing device shall be considered as a Class 1 Division 1 location and that any open space below such a pump island shall also be considered as a Division 1 location. Therefore, unless the conduit in question is buried below two feet of earth below the pump island, it would not be considered as extending outside of the hazardous area. Because of this, it is necessary to provide a sealing fitting where the conduit both enters and leaves this hazardous area, and as the hazardous area is considered to extend 20 feet horizontally and 18 inches vertically at distances more than 18 inches from the dispensing pump or island, a sealing fitting should be installed in the conduit run before entering this area and at a height of at least 18 inches or more above the driveway level for any lighting standard not mounted on the pump island itself but within 20 feet of the dispensing pump. If the conduit run is buried two feet or more below the open space in the pump island and the lighting standard is located more than 20 feet from a dispensing pump, then sealing fittings would not be required. If the lighting standard is located on the pump island, paragraph b. 1 under Section 5120 of the Code would require that the sealing fitting be located 4 feet or more above the adjacent driveway level .- G.R.

Isolating Transformer

Q. In my diagram, I would like to know two things. Are receptacles isolated from ground permissible as I show them?

What makes the little transformer get so hot? It is not overloaded. In fact, the first transformer I put on burned up.—E.A.B.



A Section 2001 of the NEC reads: "All interior wiring systems, except as provided in sections 2007, 2512, 2514, 2515, 2516, 2517 and 5083 shall have a grounded conductor..." By these exceptions the Code permits isolated ungrounded circuits under certain conditions. Such construction is specifically required by Par. 5135f for circuits feeding anesthetizing locations. Thus the permissibility of your ungrounded circuit would depend upon the use to which it is put.

You do not give sufficient information on your small transformer. If it is a 1:1 ratio unit, then the two windings on the primary side should be connected in series and the secondary coils should be connected in parallel.

Your diagram shows the two primary and secondary coils in parallel. I am assuming you took roltage readings and you actually do get 115 volts on the secondary with 220 volts impressed on the primary. Your transformer would have to be rated 440/220-volt primary and 220/110-volt secondary for the connections to be correct.

When you state that the transformer is "hot", did you actually test for the temperature? "Hot" is a relative thing and while the transformer may be hot to the feel of the hand, actually it may be at a normal temperature. Thus for example a 55 degree C rise above a

25 degree C ambient (78°F) would result in a final temperature of 176 degree F, a temperature which, will result in a very definitely "hot" feel.

It should be noted that with full load of 10 amperes, assuming the fuses would hold this load, the transformer would be overloaded to

> 10 x 115 or 1.15 kva 15% overload results, but

Thus a 15% overload results, but most transformers can carry such an overload for some periods of time.

It is also possible that one coil of your transformer had been disconnected. This would place double loading on the other coil for 100% loading of the unit. It would not take too long a period of time to overheat the transformer under these conditions and burn out the winding of the transformer.—B.Z.S.

"TW" In Conduit Another Opinion

Q. I note with much interest, your article "Pulling TW in Raceways" under Questions on the Code, January issue of "Electrical Construction & Maintenance."

While I am a very small contractor in the general use of the word, I do use some 35,000 to 40,000 feet of all sizes of TW wire during the year and have for the past five years.



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Simplex makes Type RHW Wire as ANHYDROPRENE WD-75 for use in conduits and ducts, and ANHYDREX WD-75 for direct burial in the ground. Simplex folder No. 1018 has more details about this wire. Why don't you write for it today?



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We have never yet had a short or ground. We have annual extremes of weather ranging from 10 deg. below to 110 deg above zero and operate the year round. It is true we do occasionally find some TW that seems to become a little sticky in the hot weather but with the use of a little talcum powder, that condition is immediately corrected. It also becomes a little stiffer in the colder weather but we could never complain of having any difficulties with our pulling. Of course if one tries to deviate from the Code with more bends or more wires he should look for trouble. My wiremen scream their heads off if they have to use the old type R, even in sizes 14 and 12. anymore. I think it is one of the greatest improvements in our field in many years and I have been working with insulated wires for more than 30 years .- B.D.W.

There usually is two sides to every story and this version of the use of TW in conduit perhaps reflects a general impression of field experience. Otherwise the extensive use of this type of insulation could not prevail if the unfavorable experience which occasionally comes to our attention represented field experienced to any considerable degree. It comes naturally to most of us who have experienced trouble in handling wires or other electrical equipment to condemn them without due consideration of all of the conditions involved. Perhaps in the heat of the moment we form an opinion which cannot be fully justified if all the factors involved were truly evaluated. This observaton is not intended to discredit constructive criticism which is essential to real progress. Criticism stimulates thought and very often promotes improvement. It makes all of us involved alert and aware of our responsibilities. It is the real antidote for that restful feeling of self-sufficiency which often proves to be false. and I know that any reputable manufacturer will welcome such constructive criticism given in the interest of improving a weakness which appears after the product has been installed in accordance with all rules covering its use. Pardon the digression from TW. Any comments, pro or con, on this subject will be welcomed.-B.A.McD.

Service Entrance

Recently I was given a job to add a meter to an existing job. Due to the fact that meter lugs would not accommodate any other wire than the ones in them, I was forced to go into the switch box to connect the line wire for the additional meter. This is

Wire used. From trough into 3¢ meter: 3/0 RH From 3 meter to switch: 3/ORH From I meter to switch: 6R 200-amp 3¢ meter feeds breakers No.1 and No.2 36 disc switch I & meter feeds breaker No. 3 6R wire and 3/0 RH will not fit into lugs of 3 meter, hence connections are made in disconnect Meter 4 wire 50-amp breaker 50-amp breake. breaker 3 2 A 4"x 4" trough Nipple

a 200-amp, 4-wire, 3-phase installation with a 4-in. by 4-in. trough. The wire used for service and distribution to the meter and trough is 3/0.

As it involves a great expense to alter the job, how can I do the job to be within the Code, and not rewire or install a new trough?

Can the examining inspector pass the job if under his judgment there is no fire danger? Does the Code allow the examining inspector to use his judgment in these cases? I am enclosing a wiring diagram.—D.W.

I am assuming that all other Code requirements have been fulfilled by the installation as shown in your diagram, i.e., the 200-ampere switch will be ample for the existing load and the additional load; the 3/0 wire is Type RH (200-ampere rating—see Table 1, Chapter 10) or if Type R, then this also will be ample for the load; the smaller size wire tap-offs comply with the 5 foot rule; etc.; for any of the other Code problems involved.

The matter of expense is not a question for the inspector to take into consideration per se. If the cost can be kept low and at the same time the job can be made entirely within the requirements of the Code, then the expense should be considered. However, low cost at the expense of non compliance or even violation of the Code is another matter.

The examining inspector is the sole judge for applying the Code and interpreting its requirements for any specific installation. But he must interpret these requirements in the light of accepted meanings and explanations for their application. A good inspector is a member of such recognized organizations as the International Association of Electrical Inspectors and similar

groups wherein he comes in contact with fellow inspectors and others interested in this common problem of arriving at some uniformity in "Letting the Code Decide".

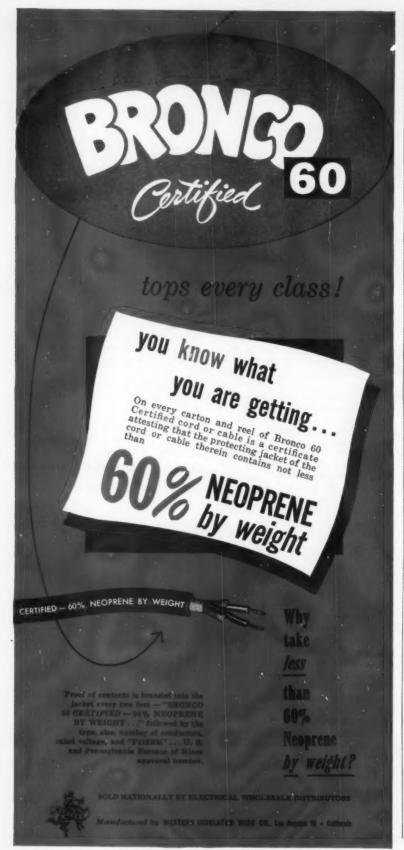
The double tap-in on two lugs at the main 200-ampere switch is a definite Code violation unless this switch is specifically approved for "feeding through or tapping off"—see Section 3737b.

I can't see why a new trough would be needed. Four 3/0 wires would occupy 4 x 4.5. or 2.0604 sq. in. (see Table 3). A 4-in. by 4-in. trough has 16 sq. in. so that even including the extra return wires for the circuit breakers, you would not approach the occupancy limit for the trough.

It would seem that the taps for the new 3-wire meter could be made at the point where the 3/0 wires coming from the main switch enter the trough. If No. 6 wire is proper for the job as shown in your sketch then it would be o.k. for tapping at this point (I am assuming that the total length of each No. 6 wire is 5 feet or less—see Section 2434c), since shorter leads would be used for these tap leads.—B.Z.S.

Grounding Conductor

We note under Section 5135 of the Code the requirement that in a hospital operating room electrical appliances shall be equipped with a polarized type of attachment plug cap, and then under paragraph f. 1 of this same section is the requirement for the use of an isolating transformer to provide energy for the circuits extending into these hazardous areas which is apparently contradictory as an isolated circuit would not be polarized. Is this a Code error?—E.R.M.



Possibly the use of the word "polarized" is an error on the part of the committee responsible for this section of the Code. However, if you will read further in this same sentence, you will notice it states the receptacle and attachment plugs shall be of the polarized type with provisions for connection of the grounding conductor and not the grounded conductor. In other words, the intent of the Code is to require that all electrical appliances be grounded through a special grounding conductor run with the circuit conductors, and the idea of this requirement is to assure a like potential of static on all objects within these hazardous areas of the hospital, and such a like potential can only be assured if all objects and persons within the operating rooms are interconnected so it will be impossible for any person or object to have a greater static charge than any other person or object in that room. Installation of a grounding conductor for appliances will accomplish this .- G.R.

Length of Conduit Runs

Is there any Code provision which limits the length of a conduit run between an outlet, pull or junction box when you have a straight run? Do you believe four quarter bends, as covered by Section 3471, should be permitted when lead-covered conductors are used? How do you figure the equivalent of four quarter bends?—E.T.H.

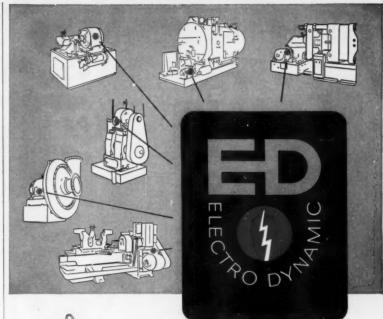
Outside of the requirements of A. Section 3014 of the Code which covers the support of vertical conductors in raceways and the need for inserting boxes at various intervals, depending upon wire sizes, I am unable to find any other definite requirement which concerns the length of a straight run of conduit between outlet, pull or junction boxes. Section 3012 indicates concern with respect to pulling wires in a conduit and the possible mechanical injury which may result. To safeguard this hazard. Section 3466 provides that the number of conductors permitted in a single conduit shall not exceed those permitted by Tables 4, 5, 9, 11 and 12 of Chapter 10; and reference to these tables shows, except in the case of lead covered conductors, that no distinction is made between a straight run of conduit and one that has four or less quarter bends. In the case of lead-covered conductors, Table No. 5, which covers the number of conductors permitted, restricts its use to straight runs or to runs with nominal offset equivalent to not more than

two quarter bends. (See fine print note Table 5.)

Section 3471 definitely restricts a run of conduit between outlets or fittings to not more than the equivalent of four quarter bends. This rule, however, does not limit the length of such a conduit run. It merely specifies that any run of conduit, 100, 500 or 1000 or more feet, shall not contain more than the equivalent of four quarter bends. This rule has been in the Code since the 1918 edition, 35 years ago. At that time, six quarter bends were recognized. This number was reduced to four quarter bends in the 1937 Code and has remained the same up to the present 1953 Code. Why does the Code avoid the question concerning the length of a conduit run? After 35 years' field experience with the present rule why shouldn't we be able to establish more definite requirements in this respect? These and similar questions may have occurred to you as they have to me. I don't presume to know all the answers. I do believe however that the following considerations are involved:

1.-A definite requirement with respect to the length of a conduit run should involve a distinction between a straight run and one having bends. It also should consider the sizes of conductors, the number of conductors used and the conduit sizes. It possibly should recognize the type of insulation used. It should differentiate between lead-covered conductors and those not so protected. It should recognize the need for exceptionally long runs in some cases. It appears evident to me, with all of the variables involved, that it would be difficult to formulate practicable requirements that would cover all considerations without resort to several Code pages devoted to this one subject.

2.—Questions concerning our present Code provisions may arise occasionally as they have in your case. I do not believe that field experience indicates, in general, the need for any extensive change in our present requirements. Possibly some consideration should be given to the apparent fact that it is easier to pull conductors of a given size through a conduit run in a straight line than when several bends are involved. At the present time, Tables 4 and 5 covering the number of conductors in a conduit are based on a 40% conduit fill with the understanding that a run of conduit may have four quarter bends between outlets. This appears to be the most severe condition of use. It therefore follows, when straight runs are used, that possibly the conduit fill could be increased. Personally I am in favor of retaining the factor of safety now inherent with the present requirements.





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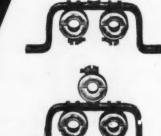
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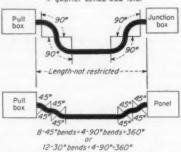
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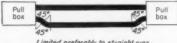


3.—Experience indicates that the very nature of building design, coupled with the wiring plans in the majority of cases, limits the length of conduit runs without resort to rules. It also is true that economy, which in many cases governs our procedure, often boomerangs in the form of added expenses. This I believe is particularly true in the case of long conduit runs. Experience indicates that the expense involved with the installation of additional pull boxes is minor compared to that incurred when the extreme limits govern our procedure. Loss of time and the chance of damaging expensive feeders are the major considerations which should not be obscured by the flicker of false economy. The question of how many pull boxes should be installed in a straight run of conduit depends on many variable conditions involved with each particular installation and the application of plain common sense. The fine print note following Table No. 4 is an indication of how the Code feels. In this case two No. 4 insulated and one No. 4 bare conductor may be installed in a conduit run not over 50 feet in length, provided the run does not contain more than the equivalent of two quarter bends. The conduit fill in this case is about 42%.

4-quarter bends, 360*total



Either of the above not applicable to lead covered Lead-covered conductors



Limited preferably to straight runs and nominal offsets equivalent to 2-90° bends.

In direct reply to your question, I believe the Code does not specifically limit the length of a straight conduit run between any type of box or fitting except for vertical conductors.

Four quarter bends are not permitted for lead covered conductors. The fine print note following Table 5 tells us that the number of lead-covered conductors permitted in conduit by this table applies only when straight runs or runs with nominal offsets equivalent to not more than two quarter bends are used. Therefore, a full quarter bend is not allowed in such conduit runs. Only offsets are recognized.—B.A.McD.

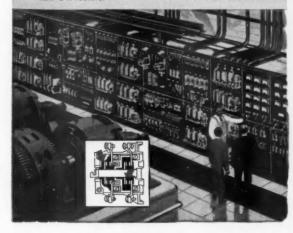
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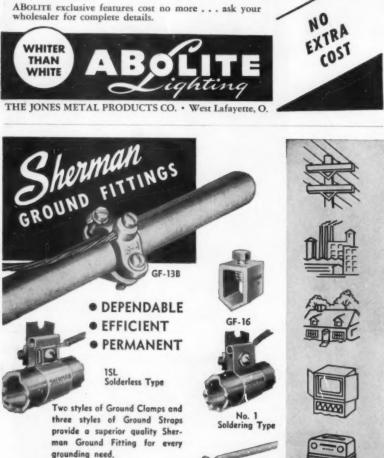
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ELECTRICAL FITTINGS

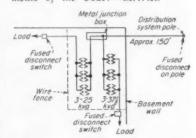
FOR WIRE and CABLE

Transformer Installation

A 2400/4160-volt wye, 3-phase, · 4-wire underground primary cable feeds two banks of transformers, consisting of three 25-kva and three 37½-kva transformers which are located in a basement of a building. These transformers are enclosed by a wire fence in a corner of the basement and each bank has a fused disconnect switch connected in the secondary side of the transformer banks. The secondary side of the two 3-phase banks are not tied together and serve different areas in the building. Three fused disconnect switches are located approximately 30 feet above ground on a pole of the aerial distribution system for protection of the underground primary service to the building. The under-ground cable riser pole is located approximately 150 feet from the build-

1. Does the 2400/4160-volt primary service to the transformer banks require a simultaneous disconnecting means within the building or will the three fused disconnects located on the aerial distribution system meet the requirements of the code?

2. Does each of the two 3-phase banks require a separate disconnecting means or will one meet the requirements of the Code?-M.W.R.



Before your questions can be A. answered we must first determine which part of the system is the service conductors. The fine print notes heading the portion of Article 230 on Services, covering "Services Exceeding 600 volts" set up three cases which can be used to determine which part of the transformer system constitutes the service conductors.

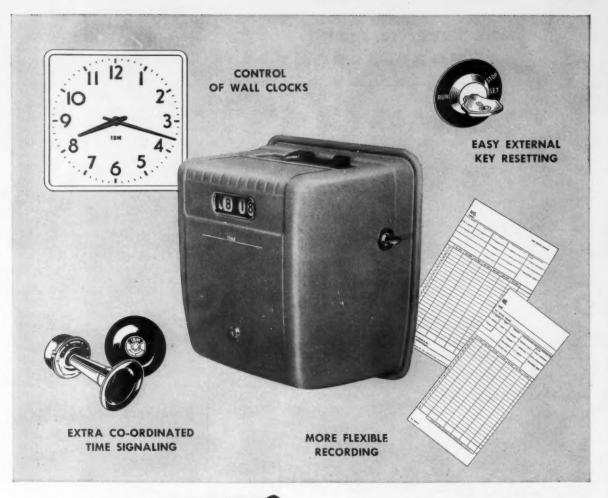
Basically, any part of the system which is under the sole control of the supply company is beyond the scope of the provisions of the Code. Your statement and diagram is not too clear on the point of equipment ownership, nor upon the type of equipment being used. However, from the facts shown I am assuming:

1. the transformers are actually the customer's property.

2. they are the dry, askarel-filled type (see Sections 4521 and 4522, and

No. 101

Light Type



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3. the secondary voltage is 600 volts

On the basis of the above assumptions, the primary conductors will be the service conductors. The primary load is divided into two sections, each a separate transformer bank. According to the general provisions for overcurrent protection for a transformer as set forth in Section 4512, each bank will have to be considered as a separate operating unit and each will have to have its own disconnecting means (See also 2388).

Paragraphs 2389 b and d will therefore cover this particular case; viz., "b"-overcurrent protection for service equipment not in a vault or metal enclosure, "d"-provisions for the circuit breaker. Paragraph "b" states that the overcurrent device shall

a. consist of an automatic trip circuit breaker of

> 1. suitable current carrying capacity, and

> 2. suitable interrupting capacity,

b. have an overcurrent unit in each ungrounded conductor, and

c. be so arranged that the operation of any one device will open all ungrounded conductors.-B.Z.S.

Breathers And Drains

We are confronted with condensate problems during the hot, humid summer months in those installations having explosion-proof wiring. Under Article 500, Section 5015c, paragraph 5 we find the subject of "Drainage".

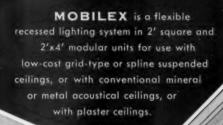
The term "approved means" is rather vague and broad in scope. It would appear to have been better expressed as some distinctive type of device having the approval of the UL and the NEMA.

While down on the Gulf recently on a tour of inspection in a refinery, it was noticed that engineers there had developed a local product that functioned with complete satisfaction. The set consisted of a breather valve placed at or near the top and a drain valve at the lowest point of the wire enclosure. These valves consisted of a loosely threaded brass or stainless steel core in the threaded center of a brass or stainless steel fitting which can be screwed into the correct position in the explosion-proof enclosure. These valves cause air to circulate through the enclosure as temperatures and barometric changes occur. threaded core of the bottom fitting permits the condensate to drain. At intervals both inlet and drain devices are rotated to insure a non-clogged condition which might occur due to scum, coagulated dust or film.

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Literature on request.

While the shop could turn out such devices for us in sufficient numbers should an extreme need arise, we feel that perhaps some production shop might accomplish the same work for far less money. Do you know if such breathers are available on the market? Failing that information is there information available in drawings or plates?—P.G.Z.

There are recognized "approved means"—and there have have been for quite some time—to fulfill the requirements of Section 5015c5. This problem is discussed in Volume II of my "Electrical Code Diagrams" published by McGraw-Hill Book Co., Inc.

The draining and breathing devices you describe are available as approved stock items (see latest Underwriters' Laboratories Inc. "Hazardous Location Electrical Equipment Lists"). Appleton Co. has a type ECB vent and a Type ECD drain; Crouse-Hinds has a type ECD vent or drain.

In all probability those you would turn out in a shop would not be approved since a considerable amount of engineering has gone into the design of these seemingly simple "valves". They require specific dimensional tolerances to insure their safe operation in hazardous locations, and the metallurgy involved to insure continued operation in continual humid and corrosive atmospheres is far from a simple problem.

An important point to keep in mind is that both units have to be used for effective protection; i.e., the vent at the highest point of the device enclosure and the drain at the lowest point of enclosure. It also may be necessary to install several of each units in a single enclosure, if very large enclosures are being installed.—

"T" Rated Switch

Q. May a "T" rated switch be used to control fluorescent lighting fixtures?—M.L.

Yes, a "T" rated switch may be used to control fluorescent lighting fixtures, but its ampere rating must be at least twice the rating of the fixtures controlled. It may be noted under paragraph c. oi Section 38.4 that switches controlling inductive loads shall have an ampere rating twice the ampere rating of the load unless they are of a type approved as part of an assembly or for the purpose employed.

—G.R.

(Continued on page 201)



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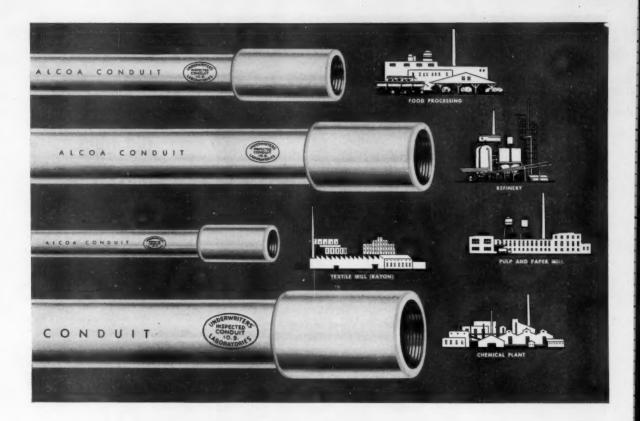
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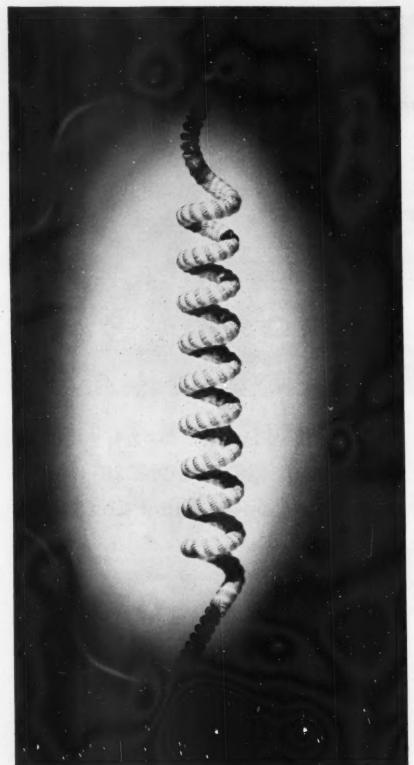
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New twist on old idea makes G-E fluorescent lamps last longer

NE of the most important materials in a fluorescent lamp is the little bit of chemical at each end of the tube. The current flows through it, electrons flow out, and the lamp starts to glow.

The old idea was to hold the chemical on a double-twisted wire coil. General Electric's new idea was to go that one better: give the wire a *triple* twist. This not only holds more chemical, it also holds it longer.

The result of course is longer lamp life and more light for your money.

General Electric's triple coil is used in G-E slimline and other G-E instant-start lamps. Just one more example of why...

> You can expect the best value from General Electric fluorescent lamps

Lamp Division, General Electric, Dept. 166-ECM-6, Nela Park, Cleveland 12, Ohio.



Modern Lighting

Functional Lighting For Drug Store

The Miller Drug Store in the Van Aken shopping center at Shaker Heights, Ohio, is a relatively long and narrow (105-by-30 foot) area with non-parallel walls and numerous structural offsets to complicate the lighting problem. Yet a satisfactory solution was worked out by using surface-mounted unshielded F96T12 fixtures on the 12-foot ceiling, following the contours of the wall cases and counters rather than the pattern of

the acoustical tiles. The result is therefore functional rather than esthetic. with an average intensity of 55 footcandles obtained on the counter tops. Fixtures mounted down the central ceiling section are 4-lamp assemblies, grouped in two lines having an approximate center-to-center distance of 10 feet. In addition, a single row of lamps is mounted above the aisle running between the left-hand counters and the wall display cases directly behind them. Wall cases are top-lighted by shielded F40 and F20 T12s, while local illumination for glass floor cases is furnished by F30T8s positioned just inside upper lead edges of the cases in narrow reflectors. All fluorescent lamps are deluxe warm white.

Supplementing the fluorescent installation are 150-watt PAR incandescent units which are interspersed between fluorescent fixtures so as to deliver higher intensities of local lighting as needed. For example, in the prescription area, the installation of an additional pair of 4-lamp fluorescent fixtures plus one 150-watt PAR unit raises the illumination to 75 footcandles on the counter, while higher concentrations of shadowless light are delivered on drawers when they are pulled out from the rear wall.

Pedestrians passing the store have their attention attracted to magazine racks and displays immediately inside the all-glass front, because directional bullet-type 150-watt reflector floodlamps on 2-foot centers are mounted along either side of the entrance and are tilted to highlight merchandise at the front of the store.

The irregular pattern of the ceilingmounted fixtures tends to give the store the appearance of being broader than it actually is and, by breaking up long front-to-rear lines, minimizes the predominating longitudinal aspects of the interior.

As to color: the ceiling is ivory, rubber tiled flooring is tan, display cases are natural wood, the upper left wall is grey, upper right wall is Chinese red, background for wall niches is pale peach, while the bottoms of niches are lined with blue velvet. This selection of colors, plus the warmth of deluxe fluorescent lamps and incandescent spots, creates an atmosphere of cheerfulness throughout the entire sales area.



UNEVEN FLOOR PLAN is lighted primarily by two rows of unshielded 4-lamp 8-foot fluorescent fixtures mounted on the acoustical ceiling in front of and parallel to wall counters. Directional incandescent PAR lamps are spaced between fluorescent units to give added punch to featured displays.



PRESCRIPTION counter receives 75 footcandles, while arrangement of ceiling fixtures produces higher intensities of shadowless illumination on contents of storage drawers when they are pulled outward from the wall.



MULTIFLEX brushes with NEOPRENE pads

... really protect your motor and generator investments. Engineered for better contact and reduced vibrations, Helwig Multiflex brushes eliminate uneven wear and reduce circulating current. Get multiple brush operation without expensive changes. The key to longer commutator life is a quality brush designed to FIT, instead of a cut-down, so-called standard brush. Save production time and money with Helwig tailor-made brushes. Write for details on the Helwig brush inventory control plan.

HELWIG CO. PRODUCTS

2502 N. 30th Street Milwaukee, Wisconsin

NEW PRECISION DYNAMOMETER



For determining the force required to actuate delicate mechanisms.

Here is a new instrument that has quickly become an indispersable aid to measure, callpressure or power required to actuate fine precision mechanisms and spring tensions of ELECTRIC CONTACTS - RELAYS - CLOCKS - TELEPHONES - BUS(NESS MACHINES - MICRO MOTORS for Electric Razors - WINDSHIELD WIPERS - TIME SWITCHES - ETC...

THE DYNAMOMETER IS AVAILABLE IN 2 SIZES WITH OPERATING PRESSURES RANGING FROM 5-15 GRAMS TO 100-1000 GRAMS.

GEORGE SCHERR CO., Inc. 200-EC Lafayette St. • New York 12, N.Y.

Good Lighting Design For Drafting Room

A lighting intensity of 100 footcandles of glare-free, low-brightnesscontrast illumination is provided for the 4,125-sq. ft. engineering-drafting room of Western Precipitation Corp., Los Angeles. This unusually comfortable lighting is produced by a specially designed lighting system incorporating a custom layout of special shielding baffles.

The drafting room is 75 feet long by 55 feet wide, and has a ceiling

height of 11 feet to the acoustical tile ceiling.

The lighting system consists of shielding baffles installed on 5-ft centers, in diagonal rows which converge at the center of the room. The baffles are 11.5 inches deep, and are constructed of steel, with white baked enamel on the lamp side.

Each diagonal row contains 14 2lamp channels, installed at an angle of 15 degrees with horizontal at the junc-

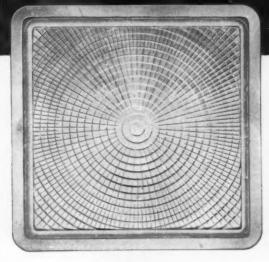


LIGHTING COMFORT with intensity of 100 footcandles is provided for draftsmen at Western Precipitation Corp., Los Angeles, by shielding fluorescent lamps behind baffles which run diagonally from side walls, converging at center of room.

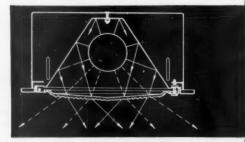


FLUORESCENT LAMPS and 2-lamp channels in continuous rows behind white enamel baffles are visible only when facing rear of drafting room.

ART METAL advanced ELIPTISQUARE



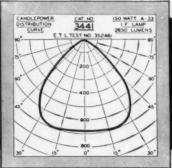
ELIPTISQUARE Multiplies Light Output



Eliptisquare reflector redirects all boxenclosed light downward through AMCOLENS to multiply tamp light utilization.

with clear, prismatic AMCOLENS

- Lighted objects reflect their true color value
- Highest light transmission efficiency
- Precise light direction control
- Edge light to ceiling for visual comfort
- Shallow recessed lens lighting



Please notice that the candlepower distribution curve is by Electrical Testing Laboratories, Inc., not The ART METAL Company.

May we send Bulletin 254 which gives complete details? Please write:

THE ART METAL COMPANY

Manufacturers of Engineered Incandescent Lighting



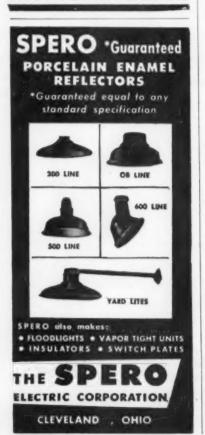
Safely supports hanging pipes, condults and cables up to 500 lbs. Rade of %-la. 18 gauge electro-galvanizad steel (elec available in Everdur, copper, brass or aluminum). Pracision mode — parferutions de net vary. &-la. holes on ½-la. conters. Cames in 10-ft. colis and 5 and 10-ft. straight lengths. Available in other lengths also.

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Specify MINERALLAC
HANGERS, CLIPS,
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MINERALLAC



tion of the ceiling and the white enameled baffle. The lamps are all 40watt T-12, standard preheat type, and standard cool white color.

The angle on which the baffles were run with relation to the side walls was carefully computed for best shielding, and is 17 degrees from the perpendicular line from the two walls. All draftsmen face in the same direction, making such an installation possible.

Brightness values of areas visible to the draftsmen when looking in normal direction are as follows: ceiling—70 footlamberts; baffles (buff side)—190 footlamberts; green side walls—180 footlamberts; green wall at front of room—280 footlamberts.

Light On Their Feet Is Nunn-Bush Motto

Customers in the Nunn-Bush Shoe Store on North Dearborn Street, Chicago, have no trouble seeing a value in footwear, for the footcandle value at fitting level is a quality-revealing 75. Salesmen, also, have an ample supply of light on their stocked boxes, with values ranging from 80 to 50 fc as the eye drops from top to bottom of tiers. The general light level throughout the 16-by-20-foot store is an even 70 footcandles, while socks on display in wall niches flanking the all-glass entrance receive half again more light to attract attention and promote sales.

Tops in the lighting plan is a luminous ceiling which, coincidentally, is a product of Luminous Ceilings, Inc. Suspended 10 feet above the tan carpeted floor, the panels are back-lighted by 32 cool white fluorescent lamps (31 F40s and one F20) mounted in continuous rows, 18 inches from row to row and a ditto distance from rows to plastic. This results in even diffusion plus the elimination of all hot spots and dark areas.

Bordering the room, recessed on 5-foot centers into the white acoustical tile perimeter, are 150-watt R40 spot lamps, housed in fixtures equipped with black-painted annular baffles to trap flare glare. The valance above stock shelves hides a continuous row of F30T8s mounted end-to-end, while sock niches receive abundant light from R40 floodlamps mounted 6 inches above the ceiling and shielded by concentric ring louvers.

This smartly tailored and lighted shop, sheathed in wormy cypress and furnished with green leather fitting chairs, is the product of lighting consultant C. T. Masterson of General Electric's Chicago Lamp Division, and architect H. B. Beidler.

200 Footcandles In Pastry Shop

High intensity illumination supplied by deluxe warm white fluorescent lamps and swivelling incandescent spots, plus a decorative scheme combining ivory, silver and coral-colored surfaces, presents attractive pastries in tempting, sales-promoting fashion to patrons of the Kaase Bakery in the



FOOTCANDLES FOR FOOTWEAR appraisal are available in quantity in this moccasin mart, where a luminous ceiling, stock shelf valance and both flood and spot recessed downlights are combined into a well planned sales-promoting installation.



MAKE WORK

JOB: Speed Industries, Inc., New Office Building, Louisville, Kentucky. ARCHITECT: Nevin & Morgan, Louisville.

ENGINEER: E. R. Ronald & Associates, Louisville.

ELECTRICAL CONTRACTOR: Henderson Electric Company, Louisville.

FIXTURES: No. 5124 and No. 5128, 2-lamp slimline fixtures with hinged doors, modified to accommodate No. 9015 Holophane Low Brightness Lenses.

INTENSITY: Small private office, 70 footcandles, initial average on desk top.

Main office, average readings at desk top level, 55 footcandles initially.

Lighting fixtures by LITECONTROL prove the value of up-to-date, glareless office illumination. For, as so many are learning, better light not only means better sight - it means also faster work, fewer errors, and fresher, clearer-thinking, "on-theball" workers.

For easy, speedy servicing or relamping of the fixtures in this installation, the hinged frames of each unit are opened by simply loosening the

self-retaining catches. If desired, the frames may be removed from the housing by hand.

Day by day, more and more owners,

architects and contractors are "turning the switch" to LITECONTROL . . . the lighting that works to make work light. Next time, you try it . . . and see!



LITECONTROL

LITECONTROL CORPORATION, 36 Pleasant Street, Watertown 72, Massachusetts

DESIGNERS, ENGINEERS AND MANUFACTURERS OF FLUORESCENT LIGHTING EQUIPMENT DISTRIBUTED ONLY THROUGH ACCREDITED WHOLESALERS



GETS-A-LITE GUARD and GUIDE Quickly and Easily Installed by

- Anyone No Tools Needed!

 Simply slip GETS-A-LITE GUARD
 AND GUIDE over the fixture, as illus-
- Made of indestructible spring steel wire. Nothing to break, get out of order
- or replace. Will last indefinitely.

 Once installed, GETS-A-LITE GUARD
- AND GUIDE is NEVER removed.

 Nothing to unlock, fuss with or lock,
- when changing lamps.

 GETS-A-LITE GUARD AND GUIDE actually steers lamp into socket, enabling maintenance man to change lamp in 10 seconds!
- Available for 40 watt and 100 watt fluorescent lamps,

Contact Your Electrical Wholesaler, OR

GETS-A-LITE Company—Dept. EC64 3865 N. Milwaukee Ave., Chicago 41, III.





GENERAL ILLUMINATION of 100 footcandles, highlights of 200 fc beneath PAR adjustable spots, and shielded T8 fluorescent lamps incorporated in all display cases are sales-promoting aids in this attractive bakery shop in Ohio.

new Van Aken shopping center at Shaker Heights, Ohio. Although small in floor area (35 by 15 feet), the liberal use of mirrors create an illusion of greater space, while the arrangement of merchandise gives maximum display value to the baked goods.

Spaced 6 feet apart on the 11-foot acoustical-tile ceiling are two rows of surface-mounted 4-lamp Kent fluorescent luminaires manufactured by Varco. Each row includes three 8-foot units, louvered with white enamel cross fins and lamped with F96T12 tubes. Between these fluorescent units also at the ends of both rows, are 150-watt PAR38 incandescent floodlamps mounted in gimbal-rings to permit

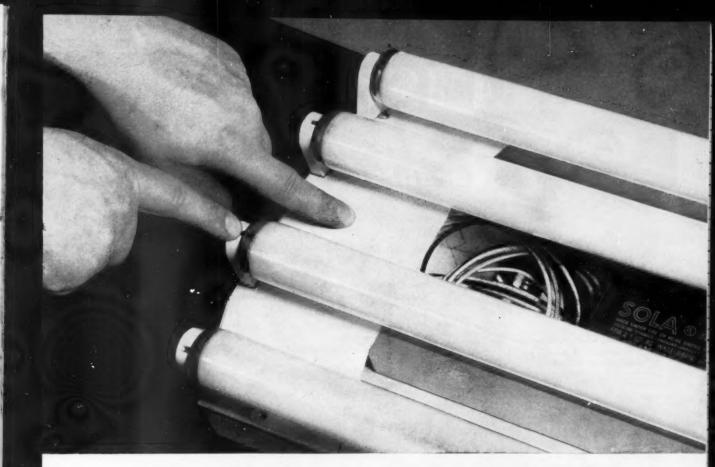
their adjustment for azimuth and declination. This installation provides an average intensity of 100 footcandles throughout the store and, beneath the incandescent spots, levels are 200 fc.

Displays are also locally highlighted by horizontal F72T8 fluorescent lamps mounted just inside the lead edges of the floor cases, and by vertical F30T8 lamps recessed at each side of each wall case. These lamps are likewise deluxe warm white.

Woodwork of counters and wainscoting is blond, while the background color of the rubber-tiled flooring and upper wall paper is coral. The ceiling, also the relief texture in the flooring, is cream, while the design in the wall paper combines silver with ivory.



FLUORESCENT STREET LIGHTING for park-type roadways was installed recently at General Electric's Nela Park, as part of a new system of modern street lighting which also includes incandescent and mercury luminaires over some of the roadways. Thirty-five fluorescent luminaires were used, all of the G. E. Form 206 type, each of which houses four 100-watt rapid start fluorescent street lighting lamps. Luminaires are slightly more than 6 feet long, are mounted 25 feet above roadway, provide uniform light on roadway with 100-foot spacings.



300 volts from lamp to ground for dependable starting of rapid-start lamps with Sola Constant Wattage Ballasts

The voltage from the electrode in a rapid-start fluorescent lamp to the grounded fixture (an important starting aid) is important for dependable starting. The higher this voltage, the more positive starting will be. Conventional, autotransformer-type rapid-start ballasts provide only 180v across lamp-to-ground. Sola Constant Wattage Ballasts provide 300v with perfect safety.

This extra 60% voltage from lamp to ground is one of the advantages that results from Sola's patented, doublewound, constant wattage circuit. In addition, lumen output is maintained constant within $\pm 2\%$ regardless of line voltage fluctuations from 106-130v.

Close the switch — a Sola ballasted rapid-start fixture will start even under adverse conditions of temperature, humidity and lamp age. This positive starting characteristic also prolongs lamp starting life.

If you manufacture fixtures, or specify, operate, or maintain lighting installations, look into the benefits of a constant wattage ballasted rapid-start system. A Sola sales engineer will be happy to give you all the facts.

Reduces relamping . . . keeps lumen output constant

SOLA Constant Wattage





Transformers for: Constant Voltage • Fluorescent Lighting • Cold Cathode Lighting • Mercury Vapor Lighting • Plastic Signs
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the only transformer backed by a 5-year guarantee! Only Precision offers this important long-range protection . . . your assurance of superior design, material and workmanship. Reduce costly repair work . . . power failure worries . . . work stoppages! Be precise — install Precision.



Carry full loads continuously . . . capable of handling emergency over-loads.



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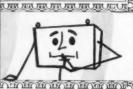
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Dependable

Ruggedly constructed to exceed latest NEMA standards!



Quiet

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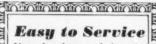
STATISTICATION

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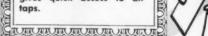


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New handy panel board gives quick access to all taps.





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1/4 to 1000 KVA . . . Voltages to 15 KV.

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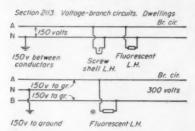
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QUESTIONS ON THE CODE

[FROM PAGE 190]

Fluorescent Lamp Voltage

According to the 1953 Code, Section 2113 limits the voltage between conductors of a branch circuit in a residential occupancy which serves screw-shell lampholders to 150 volts. I am advised that the Code permits higher voltage circuits to supply fluorescent lamps and that they may operate or use voltages as high as 1000 volts. Will you kindly explain the rules involved? There appears to me to be a conflict.—E.T.H.



*The equipment voltage may be as high as 1000 volts

A The first three lines of the first sentence of Sec. 2113 state a general provision which covers all types of lampholders, including the fluorescent type, without any restriction on occupancy. It reads as follows: "Branch Circuits supplying lampholders, fixtures, or receptacles of the standard 15-ampere or less rating shall not exceed 150 volts to ground. The last sentence of the same rule, which covers the voltage of a branch circuit in a dwelling occupancy, restricts the



READY TO LEAVE adjourned business session of Upper Midwest Electrical Industry Convention for trek over to exhibits at St. Paul Auditorium are electrical contractors (L to R): Percy Johnston, Ada, Minn., and Lawrence W. Best, Thief River Falls, Minnesota.

voltage to 150 volts between conductors when lampholders of the screw-shell type are used. You will note that this restriction does not apply to fluorescent lampholders. As a result of these two separate provisions, the voltage of a branch circuit in a dwelling occupancy is restricted to 150 volts between conductors when screwshell lampholders are used and recognizes a voltage of 150 volts to ground when fluorescent lampholders are used. I believe the illustration clarifies this point.

Section 4183 of the Code covers the voltage of fluorescent lamps used in a dwelling occupancy and limits the open-circuit voltage of such equipment to 1000 volts with an additional provision that when the voltage exceeds 300 volts, the equipment shall be so designed that there will be no exposed live parts when lamps are being inserted, are in place, or are being removed. This provision applies only to equipment such as occurs in a fluorescent fixture and in no way is concerned with the voltage of the branch circuit, which is limited to 150 volts to ground for fluorescent lampholders. If we note this distinction between the two rules, I believe there will be no question of conflict. This provision would permit "instant start" fluorescent lamps, which require 450 volts for starting, to be used in a dwelling occupancy provided the design gives the protection covered by the rule.—B.A.McD.

Magnetic Contactors — Coil Voltage

Why do the Underwriters' Laboratories permit manufacturers to make magnetic contactors with 220-volt, 60-cycle coils to operate on 110 volts? On a 4-wire, 120/208-volt, 3-phase network a ground on one of the hot conductors imposes 120 volts on the coil and the magnetic conductor will pull in. We tested same. We had to resort to 110-volt coils on 208-volt, 3-phase magnetic contactors.—P.P.G.

From information received A. from a very reliable source, it appears that one of the important considerations in the design of a coil is the assurance that it will operate within approximately 85% of its voltage rating. In order to achieve this objective it is possible and I believe it is known that some coils may operate on a voltage as low as 55% of the rated voltage which covers the case you have presented. While I am not fully informed with respect to the design problems which are involved, it appears to me that both the manufacturers and U. L. are aware of the possibilities presented; but in the absence of field



IAEI NATIONAL ELECTRICAL WEEK CHAIRMAN Herbert E. Cook, Detroit, is directing his organizational and promotional talents to the success of the first Electrical Week observance planned on a national basis. Herb's philosophy is simple: Do It Right—Do It Electrically.

experience indicating the need for a definite range within which a coil may only operate, such a provision does not exist. It also appears, however, especially in the case of unsupervised, automatic motors operating as the demand requires, that a coil so designed would constitute a hazard. This also could occur when a supervised motor is involved and the operator on all occasions does not use the manual disconnect when the motor is at rest. If you or any of our readers have any further experience with regard to this question of coil voltage operation, I know that all interested parties would like to hear of same.-B.A.McD.

Grounded Conductor

In a plant served with a 4-wire 3-phase service which had previously been served at 440 volts, in an attempt to increase capacity they are now supplying energy from the utility distribution system at 2300 volts instead of 440. Inasmuch as the old service consisted of three Type RH and one bare conductor, the contractor just replaced the RH conductors with 5000-volt cable and left the bare neutral in the raceway. Should I not also insist that the bare neutral be replaced with a 5,000 volt insulated conductor?—L.H.

A. Under Section 2303, permission is granted to use an uninsulated conductor as a grounded conductor but only when its nominal voltage to ground is not more than 300 volts. Therefore you were correct in requiring that the bare neutral no longer be used when the service voltage was increased from 440 to 2300.—G.R.



THEY SAID IT COULDN'T BE DONE

Speed delivery? Impossible! Everyone, it seemed, agreed that delivery just "could not be improved." As a result, officials of the County Courthouse and Record Building, Dallas, Texas, were on the spot to give employees and the public air conditioning relief.

That's when the Abright Electric Company, electrical contractor on the job, approached Wesco. The assignment: beat the deadline. Deliver the electrical supplies and apparatus needed so that the job could be completed before summer. The pressure was on.

Wesco went to work. They put their vast electrical resources and purchasing power into play. They tapped neighboring warehouses to fill requirements ahead of schedule. Results: delivery deadline beaten by *three full weeks*. Abright, the engineers as well as the county officials were tickled pink with Wesco's service.

Apply the same kind of teamwork and electrical know-how to your problems. With its vast resources . . . its corps of specially trained personnel and its years of experience in the field—Wesco is always ready to match fine electrical equipment with speedy service. Whatever your electrical problems . . . you can count on Wesco.



OFFICES IN OVER 110 PRINCIPAL CITIES

In The News

Wright Appointed To BDSA

Appointment of Clark M. Wright, of Schenectady, N. Y., as director of the Electrical Equipment Division, Business and Defense Services Administration, U. S. Department of Commerce, was announced recently by BDSA administrator Charles F. Honeywell.

Mr. Wright's appointment fills a vacancy caused by the resignation in December of Bonnell W. Clark, of Washington, Conn. During the interim the office of director has been occupied by Carney G. Laslie, Jr., permanent deputy director of the division.

Mr. Wright is serving the government under a rotation system whereby experienced industry men provide their services without compensation for periods of six months or longer.

Born and reared in Colchester, Vt., he received his early education and training in that town. He entered the University of Vermont at Burlington in 1918, and upon graduation with a BSME degree, became associated with the General Electric Company at Lynn, Mass.

Mr. Wright has spent his entire business career with General Electric, serving in many positions connected



RESILIENCE DEMONSTRATION of plastic conduit bushing catches eye of contractors L. H. Stemen, Burlington, N. D. (left), and T. J. Corrigan, Rosemount, Minn. John Klein, Thomas & Betts Co., Chicago, makes the test at the recent Electrical Trade Exposition of the North Central Electrical Manufacturers Club in St. Paul, Minn.



NEW OFFICERS of Minnesota Electrical Inspectors Association elected at recent St. Paul meeting are: (L to R) secretary—Glenn Rowell, Minneapolis; vice president—R. F. Lloyd, Minneapolis; president—John A. Warkentin, Mountain Lake, Minn.; assistant secretary—Stan Sayre, St. Paul.

with the manufacturing and sale of turbines at Lynn, Chicago, Syracuse, and Schenectady.

In 1947, he was appointed assistant manager of marketing of General Electric's Turbine Division in Schenectady, and in 1952 was made manager of marketing of the company's Gas Turbine Department.

NEMA Adds Electric House Heating Equipment Section

A new section was aded to the National Electrical Manufacturers Association on May 4 by the formation of the Electric House Heating Equipment Section

The scope of the section includes the following types of heating equipment principally used in houses and which use electricity as the heat source:

1. Cable units for installation as radiant heating systems.

2. Radiant panels either of glass or other materials, with or without integral component motors, thermostats, or other accessories.

3. Floor standing panels, or screens, which are adaptations of radiant panels listed under item (2) suitable for operation at voltages in excess of 200 volts.

4. Wall heaters, convection type, natural or fan forced, suitable for operation at voltages in excess of 200 volts.

5. Floor furnaces, baseboard panels and electric steam radiators.

Non-member companies who applied

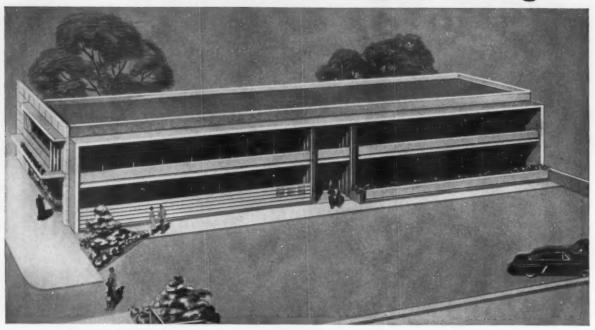
for memberships in the Association and affiliation with the section and were accepted are: Berko Electric Mfg. Corp., Queens Village, N. Y.; Ceilheat, Inc., Knoxville, Tenn.; Electrend Products Corp., St. Joseph, Mich.; Electric Heating Products Co., Phoenix. Ariz.; Federal Malleable Co., Milwaukee, Wis.; Heatmore, Inc., New York, N. Y.; Meier Electric and Machine Co. Inc., Indianapolis, Ind.; Modernheat Cable Corp., Kingsport, Tenn.; Electric Heating Products, Inc., Knoxville, Tenn.; Electriglas Corporation, Bergenfield, N. J.; Electromode Corporation, Rochester, N. Y.; Pan American Electronics Co., Nashville, Tenn.; Sunwarm, Inc., Kingsport, Tenn.; and Tennessee Plastics, Inc., Johnson City, Tenn.

Member companies of NEMA whose requests for affiliation with the section were accepted are: General Electric Company, Providence, R. I.; Rockbestos Products Corp., New Haven, Conn.; United States Rubber Company, Passaic, N. J.; and Edwin L. Wiegand Company, Pittsburgh, Pa.

Officers of the section are: Chairman: James E. Goff, vice president of Ceilheat, Inc., Knoxville, Tenn., Vice Chairman: H. O. Anderson, vice president in charge of sales, Rockbestos Products Corporation, New Haven, Conn.

The Program Committee consisting of F. T. Walsh of Sunwarm, Inc., Stanley B. Aronson of Berko Electric Mfg. Corp., and Robert E. Pequignot of Electromode Corporation, will recommend a program of activities to be undertaken by the section at its first meeting to be held early in June.

Plan for future electrical requirements with General Electric Q-Floor Wiring



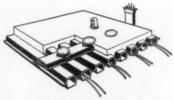
Edmond J. Jura A.I.A., Architect—Amarillo Doyle Construction Co., General Contractor—Amarillo Blum and Guerrero, Engineers—Dallas Franks Electric Co., Electrical Contractor—Amarillo

Architect's rendering of the front elevation of the Amarillo Medical Center Building, now under construction. General Electric Q-Floor wiring is used throughout the building to permit easy expansion of circuits.

Constantly changing electrical needs for X-ray machines, sterilizing equipment, operating room lighting, physician call systems, and telephone service can be taken in stride by the new Medical Center Building in Amarillo, Texas. The General Electric Q-Floor wiring system makes every square foot of floor space available for outlets. No costly alterations, no litter, no tie-up of space.

Q-Floor, a cellular steel subflooring, saves construction time, materials, and weight. Each cell is a raceway or conduit for present and future circuit requirements. New outlets can be installed any time, any place. A Q-Floorequipped building is always ready for changes in service needs.

The General Electric Q-Floor wiring system can be used in industrial, institutional, or commercial buildings. For more information, call your G-E Construction Materials district office or write to Section C42-618, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.



cross section drawing showing Q-Floor cells, header ducts, floor plugs, and wiring.



Progress is our most important product

GENERAL (ELECTRIC

1954 IES **Medalist Named**

Dr. Erwin F. Lowry of Sylvania Electric Products Inc. has been named to receive the 1954 Gold Medal of the Illuminating Engineering Society. This medal, highest honor in the field of illumination, is awarded for meritorious achievement conspicuously furthering the profession, art or knowledge of illuminating engineering. Presentation of the medal will be made at the society's annual National Technical Conference at its opening session in the Haddon Hall Hotel, Atlantic City, Monday, September 13.

Dr. Lowry is the first physicist engaged in light source research chosen to receive the society's medal. Nearly thirty patents have resulted from Dr. Lowry's research, almost all of which are related to gaseous discharge devices, especially cathodes. Most of his contributions to the art and science of lighting are found in the development

of his fluorescent lamp,

For the past twenty-five years Dr. Lowry has devoted his efforts to the specialized problems involved in the design and development of cathodes for gas filled tubes. Several new cathodes were found but, from the standpoint of fluorescent lamps, his most important work was his investigation of methods of protecting oxide cathodes from the injurious effect of ion bombardment.

In the field of phosphors, Lowry initiated and directed research that has resulted in improved color uniformity and greater light output and, through phosphor stability, in large gains in lumen maintenance.

Of importance both in the United States and abroad has been the series of papers, principally before the Illuminating Engineering Society, in which Lowry disclosed research data to correlate the electrical and light charactristics of fluorescent lamps. This series, which constitutes the basic data on fluorescent lamps, has made it possible to design fluorescent lamps to fairly rigorous specifications.

Dr. Lowry initiated and directed the research which lead to the development of the electro-luminescent lamp as a practical device and has presented several papers on this investigation both before I.E.S. and other scientific and engineering bodies.

A fellow of I.E.S. (1950), Dr. Lowry has been active in society work, having been chairman of the Light Source Committee and the Board of Fellows. He has presented numerous papers before the society and other technical bodies and has written many articles. In addition to his I.E.S. ac-



WIRING CODE EXPERTS answer all questions of packed house at recent Upper Midwest Electrical Industry Conference in St. Paul. On panel are electrical inspectors: (L to R) Ray Braun, St. Paul; W. L. Semmer, Minneapolis; Ben Lipinski, Buffalo, Minn.; and Glenn Rowell, Minneapolis.

tivities, Lowry is a member-at-large of the United States National Committee, C.I.E., a member of the American Physical Society and of the Electrochemical Society, where he has taken an active part in the Luminescence Section of the Electronics Division, of which he is a past chairman.

Since 1940 Dr. Lowry has been associated with the Lighting Division of Sylvania Electric Products Inc. where he is now manager of the Lighting Engineering Laboratories.

The naming of the I.E.S. medalist by the Council of the Illuminating Engineering Society is based on the recommendations of a standing committee of the society. The committee includes six of the Society's past presidents and three members-at-large, and operates under official society precedures and policies. The 1954 Medal Committee was headed by Walter Sturrock, past-president of the society, who is with General Electric Company, Nela Park, Cleveland.

NECA District 4 Meets in Chicago. Looks to Future

Contractors from Illinois, Indiana, Michigan and Wisconsin convened at the Edgewater Beach Hotel, Chicago, May 12-14 for the annual meeting of District Four, National Electrical Contractors Association. Those present took advantage of the open-forum type of sessions to voice accumulated gripes about various phases of their business operations. Lively floor discussions, generated by session chairman Oliver E. Burnett, Jr., encompassed a frank exchange of ideas and experiences of benefit to all present.



LOOKING IN on product exhibits at the 7th Biennial Electrical Trade Exposition in St. Paul, Minn., are Clyde Kieley, president of the North Dakota State Board of Electricity (and an electrical contractor at Grafton) and George Yineman, Minot, N. D., member of the board.



GEORGE W. ABBETT, president of Abbett Electric Corp., San Francisco, Calif., maintains close direction of his company's extensive electrical construction work on the West Coast.



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 Available for prompt shipment from St. Louis, these bus supports conform to NEMA standards and have been used by many Contractors, Industrials and Utilities. For indoor or outdoor service, for pipe or flat mounting.

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Contractors save time—labor—material with these strong, rugged THIEL Staples. They go in straight and true greatest improvement in staples for cable work (metallic and non-metallic) in 25 years. Send for FREE samples. Sold by Leading Electrical Wholesalers—write for information on open territories.

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BUSINESS POTENTIAL in residential electrical modernization market is discussed by (L to R): F. J. Tuitt, Consumers Power Co.; L. B. Houts, L. R. Klose Electric Co.; Don Simpson, Simpson Electric Co.; and L. R. Klose II, L. R. Klose Electric Co.—all of Kalamazoo, Michigan—at recent Chicago Adequate Wiring Conference.

Participants in the formalized part of the agenda explored business trends and development, why jobs are being lost, potential of the Adequate Wiring program and a frank look at labor and management.

Chairman Burnett opened the conference by urging contractors to place more emphasis on their employer-employee relations. We are in business to make a profit with a satisfied customer by giving him a good dollar value, he reminded the delegates. Such profit is actually made by and through the people, including mechanics working for the contractor, he noted.

Though business may be spotty in some areas, overall electrical construction business will be good, Joseph W. Albright, Triangle Electric Co., Detroit, told the group. His prediction is based on the consumer savings barometer, utility expansion programs and plant expansion programs, particularly in the automotive industry. Since our industry has no desire for prosperity based on a war economy, he urged contractors to consider the following factors in their present operations:

- Increased job production on the basis of a full 8 hours of work per day.
- 2. More capable job supervision.
- Abolition of existing barriers to local chapter and union membership.
- 4. Elmination of premium overtime operations.
- A re-evaluation of overhead and profit markup. This might be downward if sales were increased and more material furnished to the job by the contractor.

Adequate wiring and residential rewiring presents a tremendous market potential for electrical contractors, Lyle Foster, Peoria, reported. Almost 75 percent of the country's 44 million



DESIGNING, estimating and supervising installations is all part of the varied day's work for Paul McNally, Friedman Electric Company, Boston, Mass. Occupying his time at the moment are several interesting modernization projects in the Boston area.



NEW WIRING system in Grant Building, Atlanta, Ga., is inspected by J. P. Bomar, superintendent of the building, and Charlie Fulton, electrical engineer for Fulton Bros. Electric Co., Atlanta electrical contractors who installed the new electrical equipment. The new wiring was required to meet the demands for better lighting and air conditioning.



- 1. Electrical, "Remote Control" of POWERSTAT light dimming equipment.
- 2. Finger-tip operation through 1" long potentiometer handles.
- 3. Small "lap size" control panel that can be installed at any vantage point of your choice or can be portable.
 - 4. Individual circuit control and mastering.
 - 5. Heavy gear can be located in out-of-way spot.

The LUXTROL System gives you complete flexibility in controlling your lights. You no longer need be tied-down to a spot where heavy gear can be installed. Put the gear in an out-ofway location and put your controls in the wings or make it portable.

POWERSTAT Dimmers, because they are transformers, provide cool operation with maximum efficiency. They give stepless, flickerfree control from full on to full off. Send coupon for full detail.



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Please send full literature on the LUXTROL System.



homes need an estimated \$200 of additional wiring for each home, he added.

In a discussion of the NECA institutional advertising campaign now in progress, few contractors present could trace any new business directly to this effort, but it was agreed that it had some prestige values. Consensus was that any direct benefits enjoyed would have to come from local level promotion. Floor discussion revealed the disappointment of contractors who tried "one shot" direct mail or promotional activities and emphasized the value of consistent promotion or advertising on local levels.

E. H. Herzberg, Milwaukee, concurred in this philosophy, noting the success of Milwaukee promotional activities, including AW. He revealed that his group will employ a full-time Code expert to conduct weekly contractor sessions on the national and local electrical codes. Prime goal is more efficient contractor operation.

James W. Potter, Urbana, Ill., expressed disappointment in lack of member cooperation in providing sales, overhead and cost data to NECA's market research department. With only a 12.75% return, it is impossible for the association to develop comprehensive research data, he added. Goal this year is at least a 25% response.



LIGHTING MAINTENANCE is rapidly gaining the approval of industry and the interest of electrical contractors, as evidenced by the stack of letters received each week by Ed Creed, president of the C & S Lighting Maintenance Company of Cleveland, Ohio, who is also the secretary-treasurer of the National Association of Lighting Maintenance Companies.

In his own business, Ed finds that visual demonstrations are effective selling aids, and a simply-constructed portable reflector containing a standard and a warm white lamp (shown above) quickly emphasize color differentials to prospective customers. C & S not only maintains lighting systems, but rents all fixtures, wiring and controls on a monthly basis, resulting in considerable mutual benefits being obtained by contractor and customer.





BUSY MAN these days is Earl W. Peak, president of Central Electric Co., Inc., San Francisco, Calif., electrical contractors on the construction of the new modern Kaiser Foundation Hospital in San Francisco.

M. R. Collins Heads Anderson-Coffey Co.

Maurice R, Collins has been elected president of the Anderson-Coffey Co., Inc., electrical contractors in Boston, to succeed the late Frederick P. Coffey.

Mr. Collins has been with the Anderson-Coffey Co. for 26 years. The firm is a member of the National Electrical Contractors Association, Massachusetts Building Congress, and the Electric Institute of Boston.

New Firm

George E. Scholes has organized his own electrical contracting business under the name of George E. Scholes Co., Inc., 20 E. Sumner Ave., Roselle Park, N. J.

Mr. Scholes was formerly with the Emerson-Garden Electric Co., Inc., of Elizabeth,



ON THE JOB at the Orleans Materials and Equipment Co. is Sidney Toups, superintendent for Brignac Electric Co., New Orleans, electrical contractors modernizing this industrial ship dock.



"Rawlplugs have no equal. We have used thousands. This particular dust collector to be torn down was fastened to the wall with $\frac{1}{4}$ " x 2" band iron, using six $\frac{1}{2}$ " x 3" lag screws. We put a cable around it, thinking we could pull it from the wall. I am sure we put a ten ton pull on it and never budged it, and had to send a man up on a seat to take the lag screws out and they were as bright as when they were put up 25 years before."

(signed) E. C. Snyder
Head Millwright, Salina, Kansas.

When you require maximum holding power and the least drilling time (you drill smaller holes) use Rawlplugs.

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RAWLPLUGS: Universal screw anchor for any material. The original fibre plug for wood and log screws.

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- RAWL-TAPERS: A machine screw anchor that fits the hole drilled either by a new or worn drill.
- RAWL TOGGLE-BOLTS: For anchoring any fixture or utility in hollow walls or ceilings.
- □ RAWL CARBIDE DRILLS: Spiral precision tool for rotary drill or hand brace. Sizes ½2" to 1½".
- RAWL HAMMER-SETS: Heavy duty threaded type machine bolt anchor.
- RAWL-ANCHORS: For holding bolts permanently in materials such as concrete, marble, stone, brick, etc. Heavy duty type.
- RAWLDRILLS: For drilling holes in all masonry. Easily sharpened. For hand and power dri!ling.
- ☐ DIMENSIONAL CHART of above products

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CONTRACTOR FRED GARLING of Sterling Electric Co., Minneapolis, is impressive chairman and moderator of electrical contractor forum at recent Upper Midwest Electrical Industry Convention in St. Paul, Minn.

NISA News

The February 18th meeting of the New York Metropolitan Chapter was attended by 42 members and guests representing 33 firms. It was suggested that associate members distribute the new NISA pamphlets "Your NISA Shop—a Servant of Industry" to prospective members. Milton Volcker led a discussion of direct current brush problems and remedies.

"Fractional Horsepower Headaches" was the topic of discussion at the May 15th meeting of the Northwest-Central Chapter in Marion, Ohio. The meeting got under way at 12:30 p. m. Members has been requested to bring their shop supervisors.

Oliver E. Seeman, Ets-Hokin & Galvan, is the new president of the San Diego Chapter; vice president, Charles H. Norris, Bay City Electric Works; secretary-treasurer, Ballard C. Beekmann, California Electric Works.

J. Lee Ruppersburg, The Reserve Electric Co., was re-elected president of the Greater Cleveland Chapter. Vice president is Francis G. Allen, The Elliott Electric Co.; treasurer, George Baumgardner, Independent Electric Motor Repair; secretary, Ralph Hoskins, A-C Supply Co., Akron.

Midwestern Chapter held its spring meeting April 10th in Davenport, Iowa, at the Hotel Blackhawk. Jack Ruby, film specialist of E. I. du Pont de Nemours & Co., Wilmington, Del., discussed new types of insulation which shops will be using within the next year; and there was an "Add-A-Phase" demonstration by L. B. Ronk, president, System Analyzer Corp., Mil-

waukee. A women's program included a visit to the Davenport WOC-TV studios and luncheon and dinner with the men.

NISA Director Thomas M. Russell, Russell Electric Co. Inc., Mobile, Ala., and Mrs. Russell were host and hostess to the first quarterly meeting of 1954 of the Mid-South Chapter, held in Mobile, March 19-20. A barbecue at the Malbis Club under the supervision of Chef Russell was followed by a visit the following morning to Bellingrath Gardens. President Paul Bonham, Tri-State Armature & Electric Works, Memphis, Tenn., called a business meeting the afternoon of the same day when a resolution opposing an increase in minimum wages from 75¢ to \$1 was carried. The group suspended its quarterly meeting and scheduled its next meeting for September 18th in Memphis.

Andrew L. Huestis, vice-president of The Maintenance Co., New York, recently celebrated 30 years' service with his firm. Described as the "right-hand man" to Mainco President William J. Wheeler, Huestis joined the company in 1924 as an auditor. He became vice president in 1931.

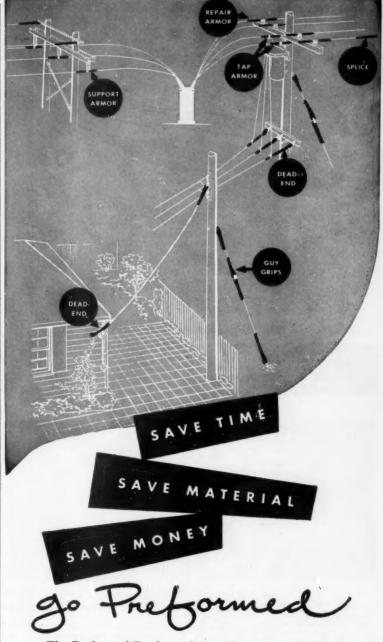
NISA members attending the 21st Annual Convention will need proof of residence—driver's license, social security card or some other acceptable identification—in order to re-enter the United States after visiting Canada. Foreign-born citizens of the United States should bring their naturalization papers.

Great Lakes Chapter wives, hostesses to women attending the 21st Annual "Family" Convention of NISA, met March 13th at the home of Mrs. Charles Howard (Howard Electric Co., Detroit) to complete plans for women's and children's convention activities

Mrs. C. E. Smith (J. E. Berger Corp., Detroit) was apopinted to be in charge of the sightseeing trips, assisted by Mrs. Robert B. Turner (Johnson-Turner Electric Repair & Engineering Co., Ltd., Windsor, Ont.), Mrs. Walter Cohen (J-C Electric Motor Repair, Detroit) and Mrs. Clarence S. Moran (Standard Electric Motors Works, Detroit).

In charge of arrangements for the visit to Dearborn Inn is Mrs. Charles J. Cannon (Nimmo Electric, Detroit), assisted by Mrs. Cecil R. Medsker (Miller-Seldon Electric Co., Detroit) and Mrs. Carl D. Miller (Howard Electric Co., Detroit).

Mrs. Charles E. Johnson (Universal Electric Products Co., Detroit) and



The Preformed Products shown above are establishing new service standards. Not only do they save countless man-hours of installation time, but also they assure a uniformity and efficiency of application unattainable by any comparable devices. They require no clips or clamps and can be installed easily by hand in

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FREE CATALOG describes and illustrates the entire line of Keystone Wireways and Fittings, Cutout Boxes, Pull Boxes, Outlet Boxes, Switch Boxes, Covers, and Bar Hangers. Contains complete specifications and prices. Send for your free copy today!

KEYSTONE MANUFACTURING COMPANY

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CONGRATULATIONS on some 57 years in the electrical business is offered Charles Foster (right) Duluth, Minn., electrical engineer and member of Minn. State Board of Electricity, by H. S. Davis, North Central Electrical Industries. Foster received Golden Jubilee Award Certificate at recent Electrical Industry Convention in St. Paul.

Mrs. Otto G. Werner Electric Co., Detroit) were placed in charge of prizes.

Mrs. Howard and Mrs. Johnson are co-chairmen of the Women's Committee.

.

Edwin R. Campbell has been named southern manager of Electro Dynamic Motor & Generator Division of General Dynamics Corp.

Maps, directing NISA members to various shops in the Detroit area, will be available during the 21st Annual Convention, according to C. E. Smith, co-chairman.

"We want to encourage members to visit as many shops as possible", the chairman said. "The maps will make it easier for them to do so."

More than 9,000 persons attended the Electrical Maintenance Engineers' Association of Southern California "Electrical Industry Show" held at Shrine Exposition Hall in Los Angeles April 1-3, where NISA was one of 105 exhibitors.

Los Angeles Committee Chairman Earle F. Sweinhart, Sweinhart Electric Co., Los Angeles, whose group manned the association booth, reported between 1,000 to 1,200 visitors at the NISA display. Besides the new exhibit, originally unveiled in January in Chicago at the National Plant Maintenance & Engineering Show, the booth featured stator winding and armature connecting demonstrations by employees of local member shops.

On the first night, single-phase stators were wound in front of the display: the second night, three-phase stators; and the final night armatures were connected. On display were five small-wound armatures, two single-phase stators, a 1-3 phase wound stator and a rebuilt commutator.

Frank E. Boyd, 63, president, Pacific Electric Motor Co. Inc., Oakland, Calif., died suddenly April 21st on board the S. S. Lurline enroute to Hawaii. He received his NISA 50-year award only last month.

Lloyd Flatland, Globe Electric Works, San Francisco, died suddenly April 17th.

Bruce W. Palmer, owner of Palmer Electric Co., Detroit, died suddenly April 3rd. He was 67 years old.

In 1912 he and two partners formed a repair and service company, and in 1914 Mr. Palmer bought out his partners to become sole owner.

William H. Guthrie, Omaha Electrical Works, Omaha, died on January 16th,

Motier W. McIntire, Electric Repair & Service, Inc., Wilmington, N. C., died March 21st at his home,

Recent visitors to National Headquarters included Hugh B. Tinling, Tinling & Powell, Spokane, Wash., and Earl T. Baker, Baker Electric Co., Denver.

Curtis F. Falldine was elected treasurer and Carl J. Anderson secretary of Acme Electric Corp., Cuba, New York.

Members of the Los Angeles Chapter who participated in a plant visit of the Larsen-Hogue Electric Company, Los Angeles, on May 11th thoroughly enjoyed the visit. This company is one of the largest and best equipped plants in California. Coffee and doughnuts were served after the trip through the plant.

Quaker City Chapter held its regular meeting at Beck's-on-the-Boulevard on May 12th and then visited the new shop of United Electric Motor Service. Joe Previty, Fred Pisano and their associates did a beautiful job.

Appointed at the very brief business meeting after dinner were a Nominating Committee consisting of Joe Previty, chairman, Bill Storck and Joe Wagner, and a committee who will arrange for the June social meeting, consisting of Bill Hendrickson as chairman, Ralph Kufen, Milt Eisenhardt, Joe Previty and Joe Wagner.

From Walter J. Prise, The Maintenance Company, New York, N. Y.

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OUTDOOR LIGHTING EQUIPMENT

... in step with the latest ideas in

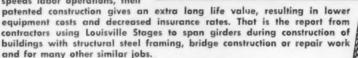
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speeds labor operations, their



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Savings on the first 90 bends repaid the entire cost of this Tal ONE-SHOT Bender—used in the electrical installation at new Technical Buildings of the Milwaukee Vocational School. 621 90° bends were made in 1½" to 3" conduit, saving 621 elbows and cuts, and many more threads and couplings. Only 3 elbows were used on the entire job BECAUSE the Tal ONE SHOT completes bends in one single operation! No shifting of conduit is necessary.

- 4271/2 hours in time
- \$438.56 in materials

SAVED ON ONE JOB WITH A TAL PORTABLE BENDER

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- Complete line of benders for rigid conduit in any sizes.
- Small combination production benders for rigid and EMT.
- TAL six-way hickeys do what others can't do.

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DATES AHEAD

- Illuminating Engineering Society— Regional Conferences: Midwestern— Jefferson Hotel, St. Louis, Mo., June 17-19.
- Edison Electric Institute—Annual convention, Atlantic City, N. J., June 1-3.
- National Association of Electrical Distributors—Annual convention, Atlantic City, N. J., Week of June 6.
- National Industrial Service Assn. Annual convention, Hotel Statler, Detroit, Mich., June 13-16.
- N. Y. State Electrical Contractors and Dealers, Inc. — Annual convention, Saranac Inn, Saranac Inn, N. Y., June 28-July 2.
- Western Plant Maintenance Show and Conference — Pan Pacific Auditorium, Los Angeles, Calif., July 13-15.
- International Association of Electrical Inspectors—Eastern Section, Atlantic City, N. J., August 30-31; Southwestern Section, Elko, Nevada, September 13-15; Northwestern Section, Portland, Ore., September 23-25; Western Section, Louisville, Ky., October 11-13; Southern Section, Tampa Terrace Hotel, Tampa, Fla., October 25-27.
- National Engineering Society Chalfonte-Haddon Hall, Atlantic City, N. J., September 12-16.
- International Association of Electrical Leagues—Bellevue Stratford Hotel, Philadelphia, Pa., September 29-October 2.
- Eastern Canada All Electrical Show— Show-Mart Exhibition Hall, Montreal, Quebec, Canada, October 6-10.
- New Jersey Council of Electrical Leagues—18th annual convention, Hotel Ambassador, Atlantic City, N. J., October 15-16.
- National Electrical Contractors Association — Annual convention, Jung Hotel, New Orleans, La., October 27.30
- National Electrical Manufacturers Assn.—Haddon Hall Hotel, Atlantic City, N. J., November 8-11.



LES GOWER of Lightning Electric, Newark, N. J., is the kind of electrical man we get a bang from, because Les is one of our cover-to-cover readers, files key articles in a loose-leaf binder, and carries the binder around in his car for reference, as a selling aid, and as a discussion medium with electrical inspectors, consulting engineers and customers.



SHOP TALK is enjoyed by electrical contractors Joseph M. Schmitz, Adams, Minn., and Gifford Perry, Austin, Minn., at MEA meeting in St. Paul.

Among the Manufacturers

Headquarters Announcements

Union Switch & Signal Div., Westinghouse Air Brake Co., Swissvale, Pa.—W. C. Dunn, supervisor of product sales in General Apparatus Dept.

Lincoln Electric Co., Cleveland, Ohio—Robert E. Sage, assistant to the executive vice president; Robert Wilson, director.

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—O V. Tally, director of industrial sales; W. L. Manly, director of general purpose equipment sales.

Triad Transformer Corp., Venice, Calif.—R. C. Seiler, asst. sales mgr. S & C Electric Co., Chicago, Ill.—S. I. Lindell, C. C. Martin, A. B. Chilcoat, L. M. Thompson, vice presidents; J. Castle, factory sales manager.

Pyle-National Co., Chicago, Ill.— John D. Ames and Harold B. Spackman, directors.

Westinghouse Electric Corp., Lamp Div., Bloomfield, N. J.—Charles E. Erb, general sales manager; R. E. Ebersole, marketing manager; H. E. Plishker, merchandise manager.

Roller-Smith Corp., Bethlehem, Pa.
—Richard C. Lipps, vice president in charge of marketing.

Lighting Products, Inc., Highland Park, Ill.—J. A. Schneller, director of sales.

American Machine & Foundry Co., New York, N. Y.—T. R. Dreyer, divisional vice president and general manager, manufacturing division.

Minnesota Minning and Mfg. Co., St. Paul, Minn.—Countryman, vice president.

A-P Controls Corp., Milwaukee, Wis.—Del Moerick, v. p., sales; R. W. Johnson, v. p., engineering.

Lindberg Engineering Co., Chicago, Ill.—R. A. Hastings, sales manager.

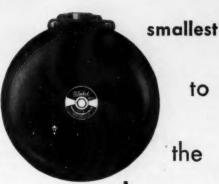
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POPULATION INCREASE at Oceanside, California and surrounding area over past ten years as result of U. S. Marine Corps' nearby Camp Pendleton has more than trebled electrical work in homes, schools, stores, and similar fields, according to Pat Davis, estimator and superintendent for Cole Electric Co., progressive electrical contractors for this locality.

Olin Industries, Inc., Electrical Div., New Haven, Conn.—Nelson B. Sherill, sales manager.

Rawlplug Co., Inc., New York, N. Y.—N. D. Stafford, vice president; F. B. Powers, sales manager.

American Machine & Foundry Co., New York, N. Y.—Rodney C. Gott, vice president and director.

Leach Corp., Los Angeles, Calif.— R. B. Hutton, vice president for sales.

Thomas & Betts, Elizabeth, N. J.— Katheryn M. Sheehan, commercial manager.

Westinghouse Electric Corp., Pittsburgh, Pa.—W. J. Maytham Dale McFeatters, Otis O. Rae, vice presidents; E. V. Huggins, vice president—corporate affairs.

Rodale Mfg. Co., Inc., Emmaus, Pa. —A. F. Timar, sales manager.

Mitchell Mfg. Co., Chicago, Ill.—George Kielty, vice president for fluorescent lighting division.

H. K. Porter Co., Inc., New York, N. Y.—W. H. Thompson, assistant to the executive vice president.

Orangeburg Mfg. Co., Inc., Orangeburg, N. Y.—C. K. Bryce, director.

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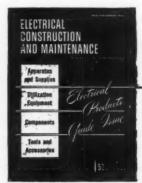
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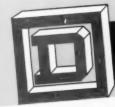
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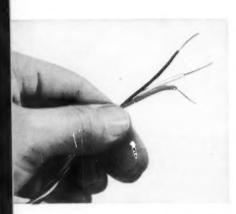
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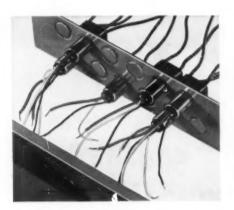
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